VOL. XXXIII NEW YORK—THURSDAY, DECEMBER 9, 1915—CHICAGO No. 24

The AUTOMOBILE

Ignition Systems Improved in Detail

More Cylinders and Higher Speeds Require Faster Breaker Mechanisms and Coils—Better Mounting and Neater Switches This Year

By J. Edward Schipper

WITH the standard of efficiency year by year reaching a higher mark in motor design, it is but natural that the motor auxiliaries are also compelled to advance in order to give a harmonious record of progress. Scanning the field of accessories there is none in which the demand for the highest grade of results has been so keenly felt as that of ignition. Better motors are only possible with better ignition. Higher motor speeds can only be attained with faster action in the sparking device. More cylinders coupled with higher rotative speeds are interpreted to the ignition manufacturer in terms of more sparks to the minute, and this is the keynote of progress in the ignition field during the past year.

Up to 3000 r.p.m.

It is a different proposition to supply the ignition for a four-cylinder motor turning at the rate of 1200 r.p.m. and a twelve-cylinder motor turning at 3000 r.p.m. The difference is that in the first instance, 2400 sparks are required per minute, while in the latter, 18,000 sparks are needed in a minute. It is just as essential for every one of the 18,000 to be a good substantial hot flame as it is for the individual sparks in the smaller number. Between these two extreme conditions is the field of the up-to-date ignition system, but, requirements are closer to the upper than to the lower limit.

In a word, progress in the ignition field can be summed up in the statement that sparking systems can operate more rapidly than ever before. Secondly, the sparks furnished are more intense and hotter throughout the upper and lower ranges of speed. Synchronism, that quality which causes the spark to occur always at the same relative part of the stroke, at all speeds is now possessed by ignition systems to a greater extent than ever before. The use of automatic advance is another growing tendency and leaving the electrical and entering the mechanical phase of development, the systems of to-day are more compact accessible, and ingeniously mounted than formerly.

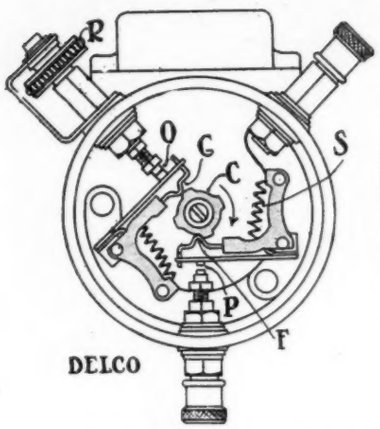
Progress

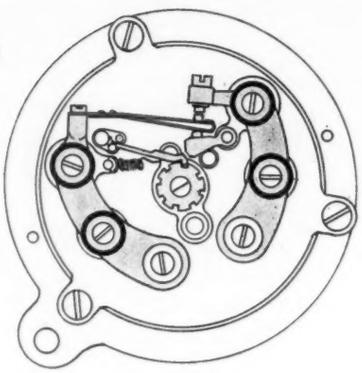
Faster Breaker Mechanism
More Rapid Coil Action
Better Timer Mounting
Ignition Adapted to 12's
Perfected Synchronism
Short High Tension Leads
Neater Dash Switches
Automatic Advance Featured
Improved Contact Points
Water-Proof Coverings

Inertia is the great foe to speed in mechanical appliances. It has to be overcome particularly in the breaker mechanism of a high-tension ignition system. Upon the rapidity of separation of the breaker points of the primary circuit, depends the heat of the spark. It is for this reason that the attention of ignition manufacturers has been very carefully concentrated upon improvements in the breaker mechanism ever since the high-speed motor began to be a factor. This year has been no exception, and the ingenious manner in which the ignition makers have met the demands for eight and twelve cylinder motors is one of the features.

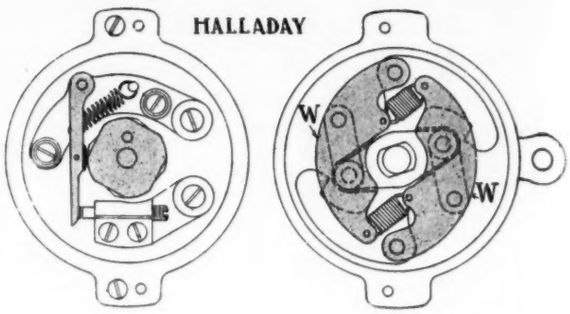
Double Breakers for Twelves

As a general feature it may be stated that the breaker box mechanism has not been altered in principle but rather in the mechanical application where the multi-cylinder V-type engine has been taken care of. Many manufacturers have used the same system but have installed a double breaker acting alternately when twelve cylinder demands have had to be met. In such designs, the breaker box merely consists of a double set of single breakers operating from the same cam but so arranged that the proper timing synchronism is maintained.





Breaker mechanisms of the Delco and Atwater Kent systems



Halladay MacNish 1916 breaker mechanism showing the method of separating the contact points in breaking the primary circuit and the weights W which actuate the automatic advance by centrifugal force

In the breaker mechanism for battery ignition there are two broad classifications based upon the method of operation. These two systems can be classified as the open circuit and the closed circuit. The open circuit keeps the primary broken until, at the time of firing, a brief make and break occurs. With the closed circuit the primary is complete except at the instant of firing when the circuit is broken and then immediately remade. The open circuit advocates claim the advantage of economy as the primary is closed for only a short period. The closed circuit advocates claim the advantage of perfect synchronism, due to the elimination of electrical and mechanical lag and a hot spark due to complete saturation of the primary.

Two Battery Systems

This broad classification of the breaker mechanisms divides into two groups all the battery ignition systems which are on the market. With both of these types of systems, it is necessary to provide some means for preventing the current from circulating through the primary should the switch be left in the on position inadvertently when the motor is not running. This necessity gives rise to ingenious contact breaking arrangements and is another feature by which the different makes can be distinguished. The three most popular methods of preventing the short circuiting of the accumulator in battery systems are the automatic throw-off switch, the latch release systems and the automatic resistance coil, which are used by the representative concerns in this field.

These three methods which will be described later are typical of the classes of systems to which they are applied. The throw-off switch which is operated by a thermostat is used on the closed circuit design while the latch release and resistance coil are parts of the action of the open circuit breaker mechanism.

Regarding synchronism the open and closed circuit arrangements also cause a difference in the principles by which this quality is obtained. The elimination of lag in the closed circuit method gives the desired constancy in spark timing while with the open circuit it is attained by representative manufacturers through the means of automatic spark advance which is designed always to keep the spark in its proper relationship to the position of the piston regardless of variation of the motor speeds. The lightening of breaker parts is also a factor in attaining synchronism as the relative lag with heavier parts would be greater at higher speeds than at low speeds.

Advantage to Driver Claimed

With reference to automatic advance there are practically no battery ignition manufacturers who do not believe that its use is an advantage to the driver. Many applications on 1916 cars use both hand and automatic, the automatic fully taking care of the speed variations while the hand advance can be used for further adjusting the spark if the driver believes it necessary. It is the contention of most ignition experts that automatic advance can regulate the spark to better advantage than the average driver. There have been tests made on this and the theory has been borne out. In fact, even with fixed spark on magnetos the hotter spark at higher speed has often more than compensated for the lack of advance and produced results which are at least equivalent to those obtained by the average driver with manual advance.

As regards the actual installation of ignition systems on cars, some very clever work has been done this year. In the V-motors particularly, it has been necessary to give an accessible mounting with efficient drive and at the same time keep the leads from the distributor to the spark plug as short as possible. With the high-tension current, even a small percentage of leak can seriously cut into the heat value of the spark and thereby impair the rapidity of explosion and reduce the initial pressure which, of course, should be kept at a maximum. The resistance interposed in the high-tension circuit also increases with the length of high-tension lead and there is therefore a two-fold reason for keeping the distributer as close to the plugs as possible. For this reason the timer-distributer unit has been generally mounted between the V blocks on eight and twelve-cylinder motors. Another typical installation is at the front end of the V just behind the fan. With four and six-cylinder motors the coupling of the distributer unit with the generator, giving an approach to magneto compactness, has been one of the developments of the year.

The magneto for eight and twelve-cylinder cars is an ignition feat which has taxed the ingenuity of the electrical engineer to the utmost. The demand has been sucessfully met, however, and even with the high speeds and rapid spark demands of this type of power plant the magneto has been found to be adaptable.

Atwater Kent Adapted to V's

Probably the most important development this year in the Atwater Kent system is the production for V-type motors of the standard system with a few detailed changes to render possible the greater number of primary breaks. The eight-cylinder instrument is so arranged that the automatic advance mechanism advances only the notched camshaft of the instrument, the high-tension distributer being carried on a central shaft which connects below the governor so that the distributer block is not moved by the automatic advance mechanism. This permits of a wide range of spark advance without affecting the synchronism.

The change in the arrangement of the advance mechanism is the most important on this device as with the eight-cylinder unit a single pair of contact points and a single distributer are employed. For the twelve-cylinder unit a double breaker mechanism is fitted, but on the eight it has been found that the critical speed of the instrument is in excess of the motor speeds yet attained.

Owing to the necessity for cutting eight notches on a single timer shaft it has been found necessary to alter the shape of the notch so as to secure equal

spacing around the shaft without cutting away too much material.

It has also been necessary to alter the shape of the lifter which is operated by the notches in the shaft to meet the requirements of the new shape of notch and these two forms of notch and lifter are shown in the accompanying illustration.

Time Element, .0033 Sec.

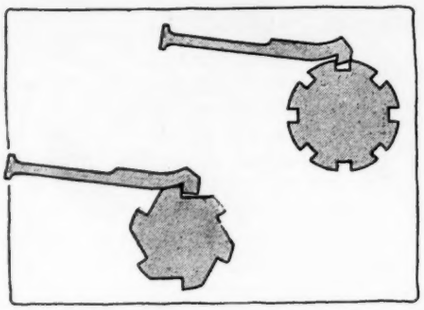
Regarding the necessity for meeting the speed requirements of the latest developments in motors of a great number of r.p.m., it has not been found necessary to make any alterations. Although working on the closed circuit ignition system which is necessarily limited in critical speed, if not by the time element in the contact maker by that in the coil, the method employed has been found suitable for use above the speeds which are now used in power plants. The time element in the Atwater Kent system is about 0.0033 seconds for the duration of the primary contact. Oscillograph curves show this clearly as illustrated. To operate at this speed requires a very rapid coil and the curve itself indicates that such is the case.

No changes of any sort have been made during the year on the standard four and six-cylinder ignition systems which have been frequently described. The only differences between the eight and twelve, and the four and six are those which have been outlined above.

The present limit to which the standard centrifugal automatic advance mechanism operates in the Atwater Kent system is 2400 r.p.m. Above this speed the supplementary hand control is used and this two-fold control has been adopted because in the belief of the Atwater Kent concern the big value of the automatic advance is chiefly in the matter of rapid acceleration and at low speeds.

With the automatic advance device the maximum advance is 45 deg. at 2400 r.p.m. in terms of crankshaft travel.

Regarding the speed under which the ignition system will operate satisfactorily, it is stated by the Atwater Kent company that its six-cylinder system will fire with undiminished efficiency up to speeds exceeding 4000 r.p.m. Tests on the maximum speeds of the eight are not as yet available. The automatic advance will take care of the earlier range in attaining the high speed and the hand advance of the upper ranges.



Illustrating difference between six and eight-cylinder breaker mechanism parts in Atwater Kent system

Advantages of Automatic Advance

Regarding the advantages of automatic spark advance the claims made for it are as follows:

1—Automatic spark advance compensates for the time element or lag and therefore, in the open circuit system compensates for the period of time elapsing in making and breaking the primary contact and generating the high-tension spark.
2.—Smooth acceleration due to the regular advance of the spark in proportion to the increasing speed.
3—Better fuel economy.
4—Less nervous strain on driver.
5—Renders car more easily handled in traffic.
6—Eliminates a point which the new driver must learn in handling his car.
7—Avoids the wear and tear due to spark knock.
8—Insures safe starting due to the retarded position of the spark.

Waterproofing the timer-distributer has been regarded as important by all the manufacturers. In the Atwater Kent system the condition has been obtained by allowing the insulated secondary terminal to come well up over the secondary wire and the distributer cap is so shaped as to shed water readily. As the position of the distributer is generally quite high, the dangers of flooding this part of the mechanism are practically nil.

At the present time, the Atwater Kent ignition system is made in three models, type K-2 with automatic spark advance made in two, four, six, eight and twelve-cylinder sizes; type H, for manual control only, made for twos and fours; type C, for single and two-cylinder opposed motors. In addition there is a special outfit for Ford cars which is complete with fitting, and for other cars, previously fitted with high-tension magnetos, a standard magneto replacement mounting is provided. This magneto mounting is made with the shaft projecting at both ends so that it will take the place of both clockwise and counter-clockwise magnetos.

All these systems are designed for 6 and 12-volt standards. The majority of the outfits turned out are for 6-volt batteries, but either may be secured.

Centrifugal Governor

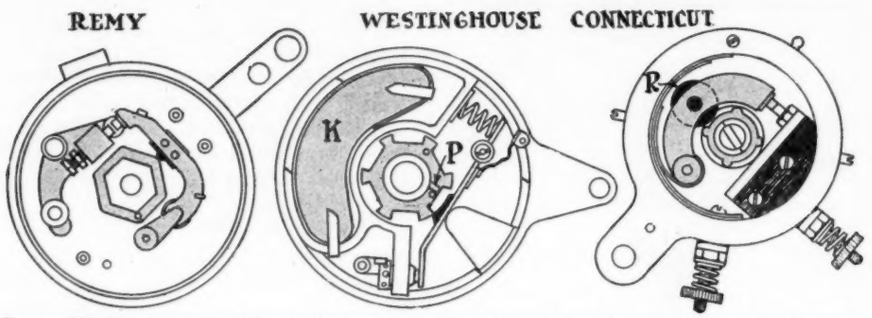
The current consumption of the Atwater Kent system is very low. It is stated, in fact, that the battery may be exhausted to the point where it will not start the motor, or even blow the horn, yet there will be ample current for several hundred miles of ignition service.

The Atwater Kent system comprises a coil, a combined breaker-distributer mechanism and a control switch. In the breaker-distributer mechanism on the K-2 model is incorporated the centrifugal governor. With this system, a single spark is delivered at the plug and the mechanism is such that the duration of current flow to the primary winding of the coil remains constant regardless of engine speed.

The circuit breaker normally has its contact breakers held apart and the closing and opening of the circuit is so rapid that it is impossible for the eye to follow the movement of the breaker points. Referring to the acompanying illustration, the shaft *S* which is the rotating portion of the breaker-distributing mechanism has four, six or eight notches in accordance with the number of cylinders. The lifter *T* catches in these notches and is drawn around with the shaft a minute distance. When it escapes from the notch, it rides up slightly on the round surface of the shaft and jumps back to its normal position by the tension of the coil spring *P*. As the lifter *T* jumps back it strikes the hammer *H*, which in turn transmits the blow to the flat spring *F*, bringing the contact points together for a minute period of time. This gives the contact and breaks it in such a short space of time that the eye cannot follow the closing of the circuit.

All of the parts which are subject to contact are made of hardened steel, the contact points themselves being made of tungsten, and one of the features of the system is that these points are protected by the switch which reverses the direction of the current flow every time it is turned on. The adjustment of the con-

Progressive steps in the breaking of the contact points in the Atwater Kent system showing how lifter is actuated by cam and illustrating the fact that it is impossible to leave the primary circuit closed



Remy, Westinghouse and Connecticut primary circuit breakers which are fast enough for the highest commercial speeds

tact points is made by the removal of shims from beneath the head of the adjusting screw which carries one of the points. It is impossible for the points to remain together and therefore impossible for the battery to be exhausted should the switch be left in the on position.

Connecticut Uses Closed Circuit

Electrically, the Connecticut battery ignition system operates on entirely different principles than does the Atwater Kent. The Connecticut is the exemplification of the closed circuit system, whereas the Atwater Kent uses the open circuit.

The Connecticut outfit comprises an interrupter and distributer unit, a high-tension coil and a very ingenious switch. All these units are unique and distinctive and represent the embodiment of principles which have been carried to a high degree of perfection to meet the rigid demands of the up-to-date, high-speed motor.

Operating on the closed circuit system, the primary circuit is broken only at the contact points when it is necessary to generate the ignition spark. The advantage claimed for this, is that the primary circuit of the coil is allowed to become completely saturated before the breaking point is reached and therefore, a spark of maximum intensity is produced when the circuit is interrupted.

Another great advantage which is claimed for this system is that both electrical and mechanical lag are eliminated throughout the entire range of motor speed, and the makers state that the eight-cylinder igniter will fire perfectly at a motor speed of 3000 r.p.m. with the single breaker arm. This means that the igniter is producing satisfactorily 12,000 sparks per minute, or 200 sparks every second.

All Lag Eliminated

The reason that the claim is advanced that in this system both electrical and mechanical lag are eliminated is that the instant after the spark has been made by the interruption of the primary circuit the contact is again made and all during the time which elapses between sparks the current from the battery is allowed to flow through the primary of the coil. Since the current is flowing, contact does not have to be made, and therefore there is no possibility of electrical lag. Owing to the velocity of an electrical current this speed is far above the requirements of automobile motors, and for all practical purposes electrical lag in this system does not exist.

Mechanical lag is eliminated for much the same reason, whereas, on the open circuit principle, contact has to be made and broken; on the closed circuit it merely has to be broken, as it has been remade immediately after the previous break.

That the extremely simple action of breaking contact can be performed by means of a cam without noticeable mechanical lag, and is one of the features claimed by the manufacturers of the Connecticut system.

This elimination of lag results in the attainment of almost perfect synchronism. Photographs exposed for 5 min. on a dial representing a complete circle and calibrated to show degrees of crankshaft travel bring out the fact that there is less than a degree variation in the position of the spark anywhere between 100 and 3000 r.p.m. In other words, for any given position of the spark lever, the spark will occur in the same position as regards piston travel at any engine speed.

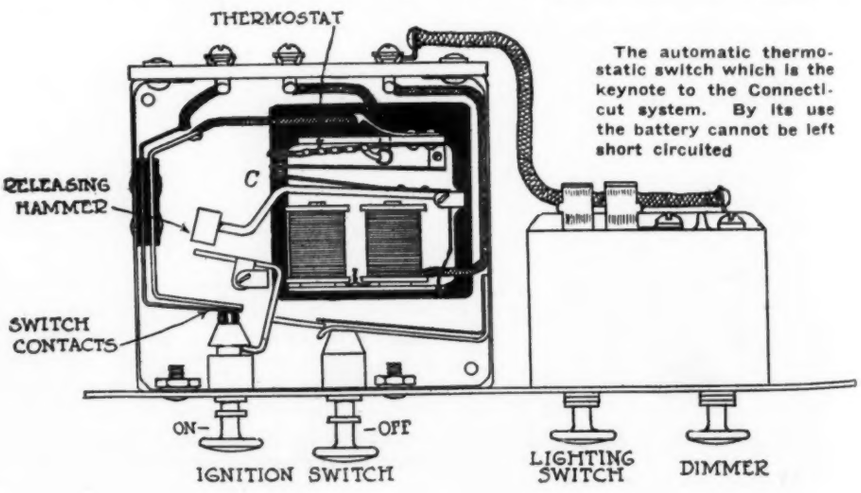
The mechanism of the breaker consists of an arm *A* carrying one contact piece, the stationary block *B* carrying the other contact, an insulated roller *R*, which is carried by the arm *A* and the cam *C*, which is mounted upon the driving shaft in the center. Upon the cam *C* there are as many points or high spots as there are cylinders on the motor. Normally the two contact points are held together by the action of a light spring upon the arm *A*. When one of the high spots corresponding to the firing point in one of the cylinders lifts the roller the circuit is broken and a spark produced. For a four-cylinder motor, the cam high spots are 90 deg. apart; for a six they are 60 deg., and for an eight they are 45 deg.

Has Automatic Switch

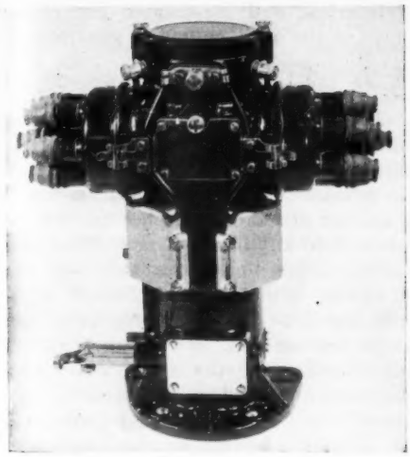
The Connecticut switch is very distinctive in the employment of a thermostatic circuit breaking arrangement which prevents the battery from being exhausted should the driver accidentally leave the switch in the on position when he leaves the car. It is an electro-mechanical device so arranged that the battery switch button is thrown back into the off position if the switch is left on by accident. During the year a lower-priced switch has been brought out which houses the thermostatic device in a square casing instead of the cylindrical one of the older model. The principle, however, is exactly the same.

The method of operation is by utilizing the properties of the thermostat, which becomes warm from the current of the battery and bends downward, making contact with the point. This completes an electric circuit which energizes the magnets in the solenoid coil, causing the arm to operate like a bell hammer or buzzer. This arm drives against a plate, which in turn releases the button in the switch, which is depressed. This breaks the battery circuit and prevents exhaustion.

The distributer unit is of conventional design, but the contact between the distributer rotating member and the distributer points may be either by brush as in a wiping contact or a gap which



The automatic thermostatic switch which is the keynote to the Connecticut system. By its use the battery cannot be left short circuited



Delco breaker mechanism applied to the Packard twin-six

the high tension current jumps may be used. This is optional.

Delco Combined with Generator

Although the Delco installations vary on every car upon which they are furnished, the underlying principles are very much the same. In a great majority of the Delco systems the single unit machine—that is, combined motor-generator for starting and lighting, is used, and with this is provided an igniter unit. In many cases the igniter unit is not included, and in still other installations separate ignition units are furnished either in, or not in, combination with separate motor and generator. This gives a very broad line, and one which of necessity causes slightly different designs to meet the needs of the case.

The Delco breaker mechanism operates on the open circuit system, that is, the primary circuit is broken at the points except during the brief interval in which contact is made at the time the spark is required. The breaker mechanism is operated by a cam on the central shaft, this cam having as many points as there are cylinders on the motor. The spring which holds the contact points apart, during the operation of the motor between sparks, holds the follower against the cam and also acts as the operating unit in separating the points on the break.

With this breaker mechanism it will rarely happen that the motor comes to rest with the follower on one of the points of the cam, but should it do so this would leave the primary circuit complete and would cause current to flow from the battery. Were some means not provided to check this current the battery would be exhausted. The means taken is an automatic resistance unit which is cut into the circuit should the cam follower come to rest upon a point of the cam leaving the primary circuit complete.

The resistance unit is a coil of high resistance wire wound on a porcelain spool and generally mounted on the distributer housing. Under ordinary conditions it remains cool and offers little resistance to the passage of the current. However, if for any reason the primary circuit remains closed for any considerable length of time the current passing through the coil heats the resistance wire to a point where little current can pass, thus insuring against a waste of current from the battery and damage to the ignition coil and timer contacts.

Delco Breaker

Referring to the illustration, the operation of the breaker mechanism is readily understood. As the cam rotates, it lifts at each of the high spots the follower, bringing together the points. After passing the high spot the points are separated by the action of the coil spring. The follower is so arranged that the circuit through the points will be broken when that at the points is complete, thus throwing into circuit the resistance unit when it is needed. In another form of breaker used the resistance unit is directly in connection with the one set of points, and comes into action when the flow through the resistance coil becomes constant instead of intermittent.

The ignition coil on the Delco system is mounted in various positions on different cars, and the switch also varies according to the installation.

Remy Principles Unchanged

The Remy battery systems are the same that this concern has been making for the past three years, although in detail a few changes have been made to meet the changing requirements in motor design. For the eight-cylinder V-type motor a single breaker arm with an eight-pointed cam is employed, and for the twelve-cylinder V-motor a distributer which has two breaker arms is used. Both of the breaker arms on the twelve are positively actuated by the same chrome nickel steel cam, the breaker arms are superimposed so that any looseness in the bearing of the distributer will not affect its synchronism and but one coil is used in connection with the twelve-cylinder distributer.

In order to secure maximum speed in the breaker mechanism the weight of the breaker arm has been decreased by making it of pressed steel, and in order to secure a very fast but smooth break a rebound spring has been added. The pressed steel arm was used in a few of the 1915 distributers.

The Remy is another example where the details of design vary with practically every installation. The range of advance is a good example of this. For instance, on the Chalmers 35 the distributer has a 50-deg. advance. On the Oakland 32 a 40-deg. advance, on the Reo 4 a 44-deg. advance, and on the Reo 6 an advance of as much as 60 deg.

The advance in motor speeds has not caused any change in the principles of breaker mechanism on this system, as on road and block tests the limit of efficient spark production has not been reached in practice. The cam faces are ground and inasmuch as a spark occurs at the opening of the points, synchronism is maintained, regardless of engine speed. This system operates entirely on the closed-circuit principle, the points being knocked apart by the cams which rotate at half engine speed.

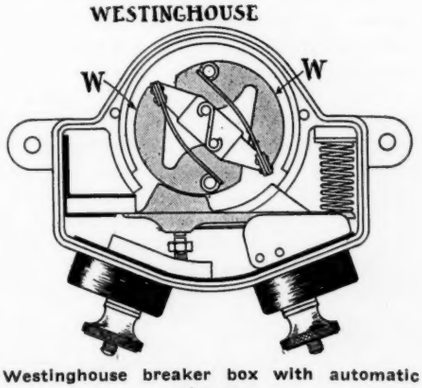
The Remy battery ignition system differs from others in that the advance and retard mechanism is entirely separate from the distributer cover. When the timing lever is moved the cover remains stationary, obviating the necessity for moving the wires and avoiding the possibility of chasing the insulation.

Westinghouse Has Automatic Advance

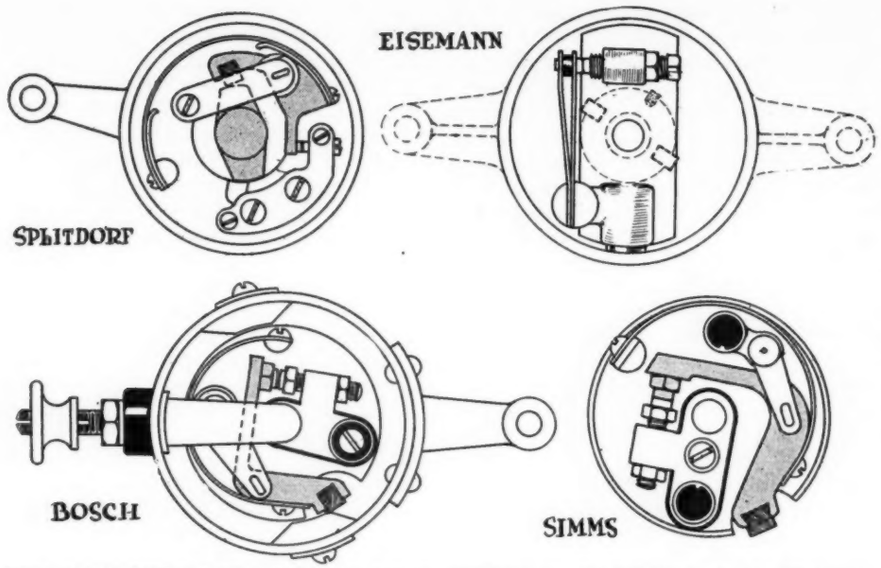
Automatic spark advance is one of the features of Westinghouse ignition. This automatic advance operates over a range of 45 deg., but provision is also made for manual operation. The spark lever, however, need not be touched when running if it is not desired.

The principle upon which the system operates is the closed circuit, and the centrifugal weights are a factor in the interruption, the operation of the ignition system beginning with the making of the primary circuit of the coil when the centrifugal weights governing the automatic advance push down the fibre part known as the bumper, allowing the interrupter contacts to close. This sends the primary circuit through the core of the coil. At the time the spark is desired the contact points are suddenly released under the influence of the bumper spring and the spark is made.

As the speed of the engine increases the weights are thrown out from the center and automatically advance the time of closing or opening the interrupter contacts and hence advance the spark. At the same time, due to their shape, they keep the contacts closed during a greater part of the revolution when running at high speed, thus making the time period



Westinghouse breaker box with automatic advance



Four representative types of breaker box as employed on the Splitdorf, Bosch, Eisemann and Simms magnetos

of contact practically the same for all speeds and preventing the spark voltage from falling off at the higher rate. This in a way combines the advantages of both the open and closed circuits.

Detachable Distributor

A separate ignition system is also marketed for systems that do not contain timing, distributing and high-tension parts. It has the same type of circuit breaker as that just described except that there is no automatic spark advance feature. The interrupter on this is equally efficient running in either direction.

The Westinghouse distributing mechanism is of the usual flat-faced type, but is specially designed so that the detachable distributer plate can be readily placed in position without interfering with the contact brushes and without the use of tools.

In many of the installations the ignition coil is made an integral part of the generator, giving an arrangement which is very similar in compactness to that of a magneto. The coil is solidly embedded in the insulating material of the distributer plate and all connections are made automatically by putting on the distributer plate and inserting the holding screws without the use of tools. In this way no wiring is required between the generator and coil.

There are several types of ignition switch which are standard. The one most used is the snap type, combining in the same face plate the ignition and two lighting switches. The direction of current through the interrupter contact is reversed every time the switch is turned on, which reduces the wear on these points.

MacNish for Eights

L. P. Halladay Co. is making a special design of the MacNish ignition system for the eight-cylinder high-speed engine, this being an innovation this season. The breaker lever in this eight-cylinder design is faster than former models and the coil is especially wound to give the rapid action necessary for the multi-cylinder motor when it is running at very high speed.

In principle the eight-cylinder design does not differ materially from the six or the four. The same scheme of current regulation, which is mechanical and requires no adjustment, and the same positive breaker action are employed. Both hand and automatic advance is supplied on this system, and the machines for eight-cylinder cars are guaranteed to work perfectly at 3500 r.p.m., or in general at speeds higher than are reached by the commercial eight-cylinder engine, either on the race track or on the testing stand.

The Halladay system operates on the open circuit and the position of this concern on this matter is that the excess current drawn in operating other types of apparatus is an important factor. The statement is made that the actual waste in some instances is large. The greatest amount of waste occurs at low speeds, it is stated, exactly in that part of the speed range where the generator is working at the smallest electrical advantage.

The 1916 MacNish models are made for four and six-cylinder cars with automatic advance, with four and six-cylinder cars with hand advance and eight-cylinder with automatic. There is also a special fitting for the Ford, and the machine may of course be adapted to a large number of cars having vertical timer shafts. The coil is regularly wound for 6 volts, and may be used with dry cells. It is possible also to operate this system from the generator if the battery fails. The coil is cylindrical and is adapted for attachment to the dash, engine or generator.

Bosch Line Complete

Magneto design has been fairly well standardized for the past few years, and only the introduction of new types of distributer and breaker mechanism to meet the demands of eights and twelves has caused any innovations in the field.

The Bosch line for automobiles now comprises principally the N-U 4, D-U 4 and the Z-U 4. For heavy duty work there are the Z R and Z types, for the six-cylinder cars the same line is used only known as D-U 6, etc.; besides these there is the Bosch vibrating duplex outfit, which has become standard on several makes of cars for this year.

With this complete line every zone of motor design is covered, the smaller four can be taken care of by the N-U 4 magneto which was brought out about one year ago, and is fitted regularly on some of the smaller displacement fours. For intermediate fours the D-U 4 and Z-U 4 are used, the letter Z in Bosch nomenclature standing for waterproof construction and in general a Z magneto has replaced a D of the same general design, except that it was not waterproof.

The N-U 4 is a distinctive small car design, in which the aim has been to reduce weight while at the same time providing an efficient and hot spark. The lightness has been secured by the elimination of the distributer as an independent part and the work of the distributer has been turned over to the slip ring, which in this design is double, instead of single, and which has two grooves into which bear four brushes in sets of two. Each groove has two brushes at a distance of 180 deg. apart. Into these grooves are imbedded two metal segments, each at 180 deg. apart, taking the place of the distributer and passing the high-tension current to the brushes, from which it is taken directly to the plugs.

With this arrangement two sparks are provided for a revolution, and since the magneto is driven at crankshaft speed there is an ineffective spark one revolution behind the effective spark, so that in timing care has to be taken that the inlet valve is not open when this spark occurs, and preferably that the exhaust is still open.

The Bosch vibrating duplex ignition system offers a simple and positive method to permit easy starting. It is recognized that in the magneto the armature shaft must reach a certain speed before the magneto output is up to normal. At this time, also, the effects of inferior gas mixtures due to low grade fuel renders necessary a good spark. With the vibrating duplex system a low-tension vibrating duplex coil is thrown into connection with the primary winding of the regular high-tension magneto, pro-

viding a hot vibrating spark at the low speed. When running at the normal speeds, the vibrating coil is thrown out and ignition is provided by the magneto.

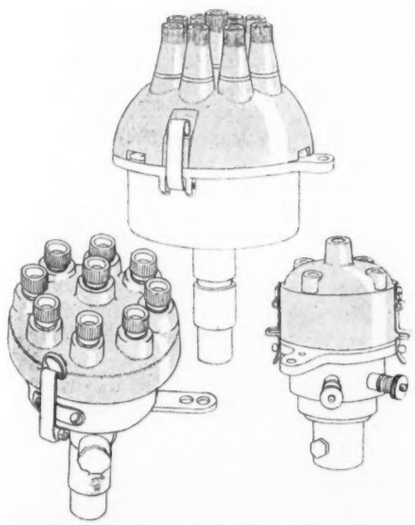
Vibrating Duplex

The principle of operation is that the battery current, upon reaching the coil terminal with which the coil winding is connected, passes through the winding to the iron core, thence to a flat vibrator spring with its contact, then to the adjustable vibrator screw and finally out of the coil by means of the second terminal. When the complete battery circuit is established the coil winding acts as an electro magnet giving a vibrator action, causing the intermittent spark. The switch permits of an off position, in which the battery circuit is interrupted and the magneto is grounded, next a battery position in which the switch connection between the magneto and ground terminals is interrupted, affording the battery current a direct path to the grounding terminal of the magneto. Besides, there is a magneto and a coil and magneto point. This permits of starting with the vibrating duplex system and then switching to the magneto.

The other Bosch magnetos are straight high-tension designs with the Bosch breaker and distributer plates which have been used for some time past.

Remy Uses Shuttle Armature

Remy magnetos are marketed under the model names of P, 30, 31 and 32. These instruments are all of the shuttle or H-shape armature type, which are designed to produce a dynamic spark at low armature speeds. The Remy model P is designed for ordinary automobile use, and 31 is also for passenger car service, while models 30 and 32 are for trucks and tractors. The model P is a single distributer instrument and the 31 has a double distributer.



Characteristic timer distributors—Atwater Kent six, Connecticut four and Remy eight

The armature of the Remy magneto carries only the low-tension winding. The coils for producing the high-tension current are separate and are generally mounted behind the dash. The switch is in a unit with the coil and in general practice projects through the instrument board. In the construction of these magnetos, the armature is made up of layers of soft Norway iron to secure maximum magnetic permeability. The armature heads are made from hard bronze and the shaft is cast integrally with the head, providing a rigid construction with the two different metals joined to provide minimum weight.

Waterproofness is secured by the use of a new design of Bakelite cover plate which also excluded the dust from the distributer parts. The terminals which are fastened to the outside of the cover plate, give an exceptionally accessible layout. Timing is simple on this magneto as by means of a timing button, the circuit breaker can be brought to the proper position to indicate the break in the primary circuit. In timing, the engine is turned over until No. 1 cylinder is on top center on the compression stroke. At this time, the button at the top of the distributer is pressed and the magneto shaft is turned until the plunger of the timing button drops into the recess of the distributer gear. In this position the magneto is coupled to the motor and the timing is complete.

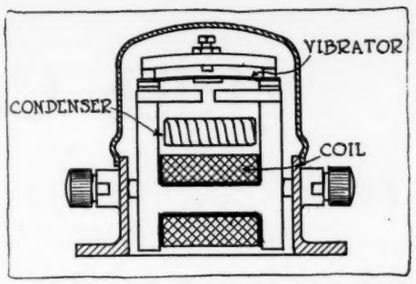
Eisemann Markets Nine Models

No changes have been made in the Eisemann instrument during the past year, although a new flexible magneto coupling has been introduced during the interval. The increase in motor speeds during the year have not caused any changes to be made in the design of the breaker or distributer mechanism as these have been found to be fast enough to take care of the increased demands.

The Eisemann magnetos were modeled after the German make of the same name and since these magnetos were supplying current for the European designs which are of high-speed characteristics, no new problems have been introduced by the increased speed in this country. The timing range of advance on these magnetos is 35 deg. on the crankshaft with the manual spark control. On the automatic advance type, however, there is a range of 60 deg. advance. These magnetos are guaranteed for 2500 r.p.m. on four-cylinder motors and 3500 r.p.m. for sixes.

Waterproof Designs

The present magnetos are waterproofed by having the magnets covered and by fitting a patented distributer plate which prevents water, dust or oil from reaching the high-tension terminal. The make and break mechanism is likewise protected by a waterproof cover. The models made are now designated as follows: G4, fixed spark or manual control for four-cylinder motors; GN6, manual spark control for six-cylinder motors; GA4, automatic spark control for four-cylinder motors; GNA6, automatic control for sixes; EMR4, dual ignition for fours; EME6, manual control, dual ignition for sixes; EMAR4, dual with automatic spark control for fours; EMAR6, dual with automatic spark control for sixes; and G1, G2 and G3, single ignition with manual control or fixed spark for one, two or three-cylinder motors.



Diagrammatic section of the Bosch vibrating duplex coil showing housing of coil and condenser with vibrator mechanism

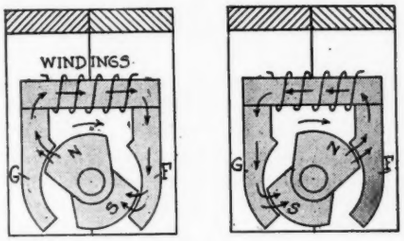


Diagram showing how the direction of the lines of force in the Dixie magneto is changed twice in each revolution

For any of these models, the Eisemann impulse starter can be fitted which facilitates starting in very heavy motors or motors with very high compression, a special fitting for Fords is also made consisting of an attachment which can be easily fitted to that car to provide it with Eisemann magneto ignition.

One of the features of the Eisemann magneto which is distinguishing is that at no time is the armature separated from the magnetic field. In this way the armature acts as a keeper and permits the magnets to retain their magnetism.

Splitdorf Dixie for Twelves

The feature of the Splitdorf announcements for 1916 is the addition of a twelve-cylinder model to the Dixie line. This new magneto operates on the same principle as the other Dixie model, having stationary winding and no armature in the general sense of the word. The four automobile models are designated as 40, 60, 80 and 120 for four, six, eight and twelve-cylinder engines.

(*Continued on page* 1081)

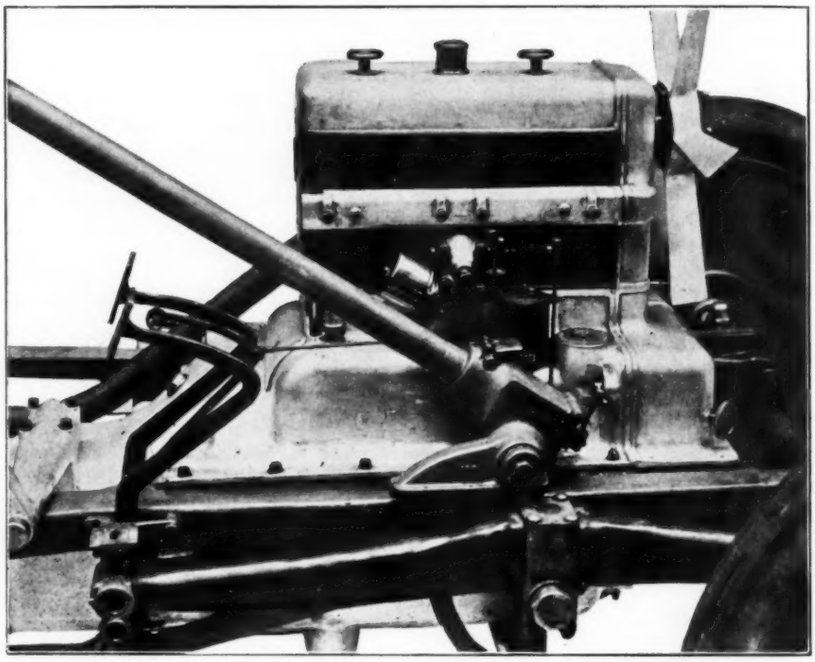
Irish Car Is Self-Lubricating

British Design in Which Every Portion of the Chassis is Lubricated Automatically—Europe's Chief Contribution to Engineering Progress of the Year

IN a time of engineering stagnation, such as is the present time in Europe, it is possible to chronicle the appearance of one new car which is more utterly new than anything that has been seen for a good many years. While engineers have been working along certain lines of motor development the creator of this new car has turned to other matters and has accomplished something that ought to give the engineers seriously to think. The main idea of the new chassis is that beyond filling up the gas tank and putting oil into the motor nothing else whatever need be done to it throughout a season's use. There is not a greaser nor an oil cap which need be touched save at intervals of many months.

About the main parts of the car there is nothing radically new, it is a sane design in its principal details, combining much of British, French, Italian, and American practice; it is in the detail that the work of its designer mainly lies.

At first reading the impression will certainly be gained by most engineers that the chassis is not practical, that it is commercially impossible. Studied attention to the detail, however, shows that this first impression may not be right. Probably the principles could not be applied to a cheap car, but they could be applied where a moderate price is obtainable and the owner who once had the advantages offered him by this self-lubricating system would never want to return to the conventional type of car.



The four-cylinder 3⅛-in. bore motor is 16¼ in. long over all. This view shows the side of the crankcase which has the reserve oil reservoir, and the cap thereof. The leather inclosure of the automatically lubricated spring is also shown. Observe that the spark plugs are protected by a cover which has cut-out buttons

The new car is not yet being manufactured, though a few are being built by the designer, J. B. Ferguson, owner of a repair shop and garage in Belfast, Ireland. Mr. Ferguson has been in the repair business for many years and has slowly developed the design of his car, always with the thought of overcoming difficulties with ordinary designs which his daily work revealed. The generalities, the four-cylinder engine for example, may not be suitable outside Europe, but the detail has world-wide application, in fact the rougher the country the greater the advantage of the car's self-lubricating power.

Main Layout Ingenious

However, the main ideas of the design apart from detail are too unusual to pass over without mention. For details of the engine the drawings are almost sufficient. The overhead camshaft is driven by skew gears on a vertical shaft and the exhaust valves seat direct in the cylinder heads. The inlet valves are in cages, and by taking out a cage the exhaust valve can then be extracted. An American engineer would prefer to use a detachable cylinder head but the Ferguson design is certainly lighter. A special tool is provided with which carbon deposit can be scraped out without removing the cylinders. The small holes shown are for the purpose of carrying water completely around the cylinders, and are drilled after the casting is made, not cored in, the advantage of this elaborate operation being that several inches of length are saved.

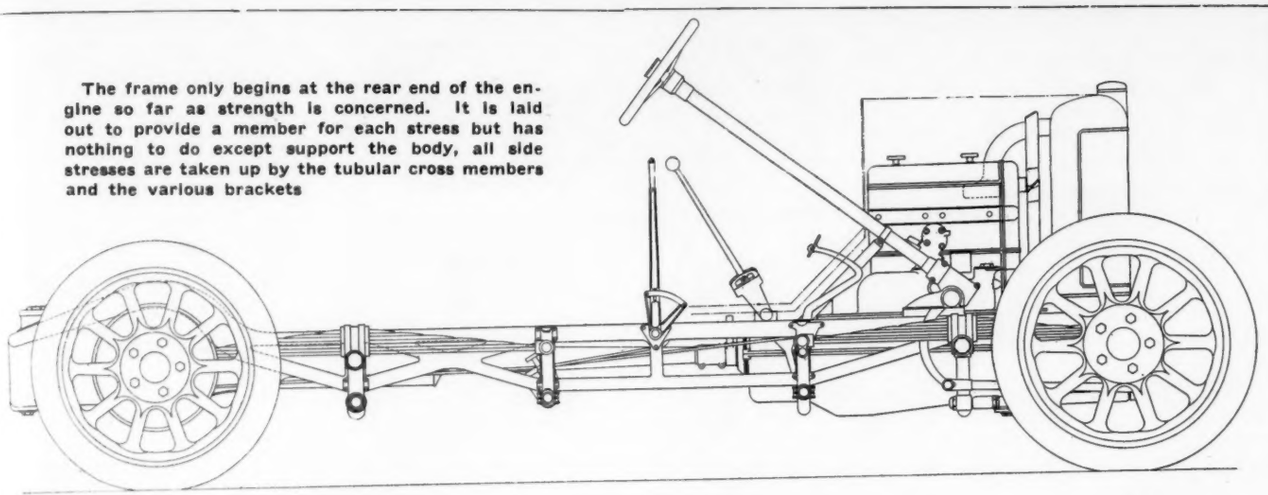
However, to come quickly to the lubrication, the engine has a complete pressure supply, even the piston pins being fed through small aluminum tubes which are carried up the connecting-rods. The ingenious feature of the engine oiling system is that an auxiliary tank holds about 1½ gal., this being cast integral with the crankcase. Oil poured into the filler first charges this auxiliary tank and then overflow supplies the crank chamber. Afterwards, when the level in the engine gets low, pressure on a knob on the side of the crankcase sends some of the reserve into the main part of the crankcase. The effect is that a supply of cold oil is always available.

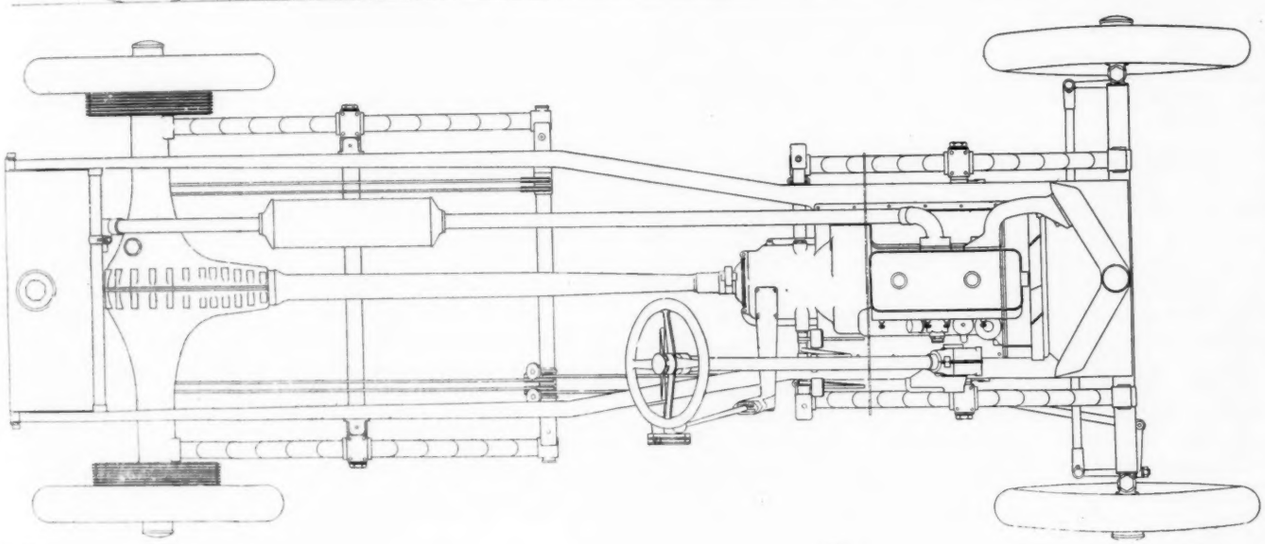
The oil supply to the cylinders is controlled by the throttle so as to proportion the oil supply to the work the engine is doing. The control consists of deflector guards which are arched over the crank webs and catch the oil flung off. As the carbureter throttle is opened these guards are drawn back and more oil thus allowed to pass into the cylinders.

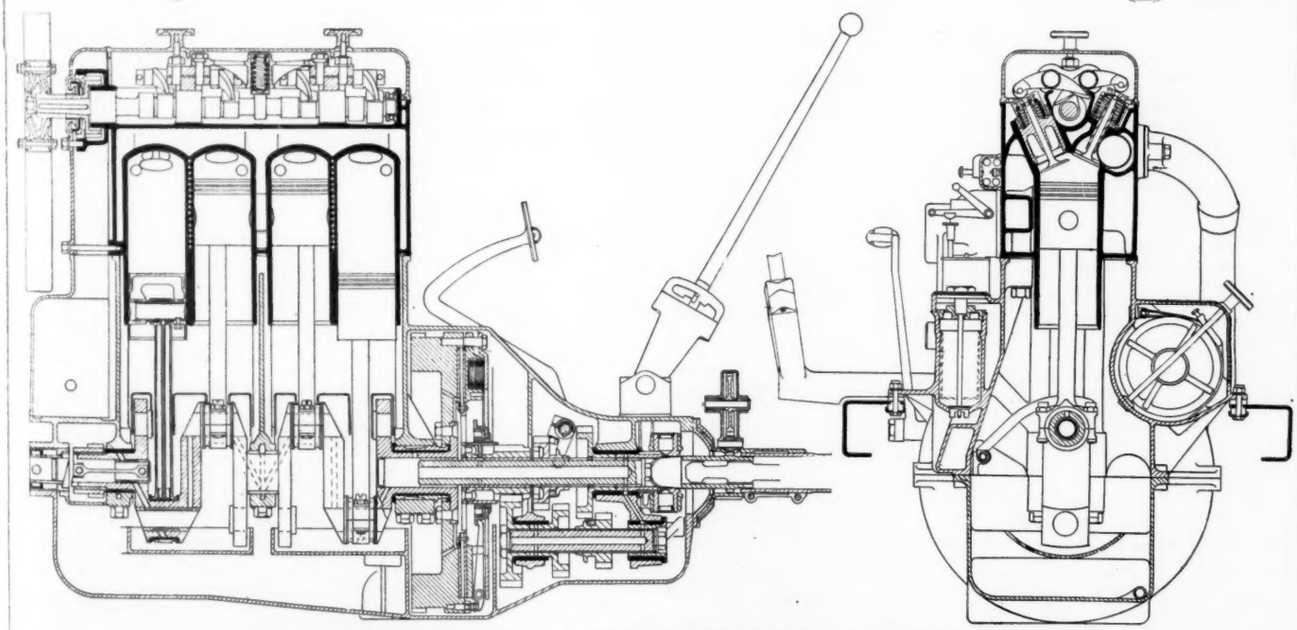
Oil Fed to Gearset

It will be noticed in the drawings that the crankshaft has the end of the hollow main shaft of the gearset spigoted into it, so the oil that is fed to the interior of the crankshaft by the engine pump also passes into the gearbox and lubricates

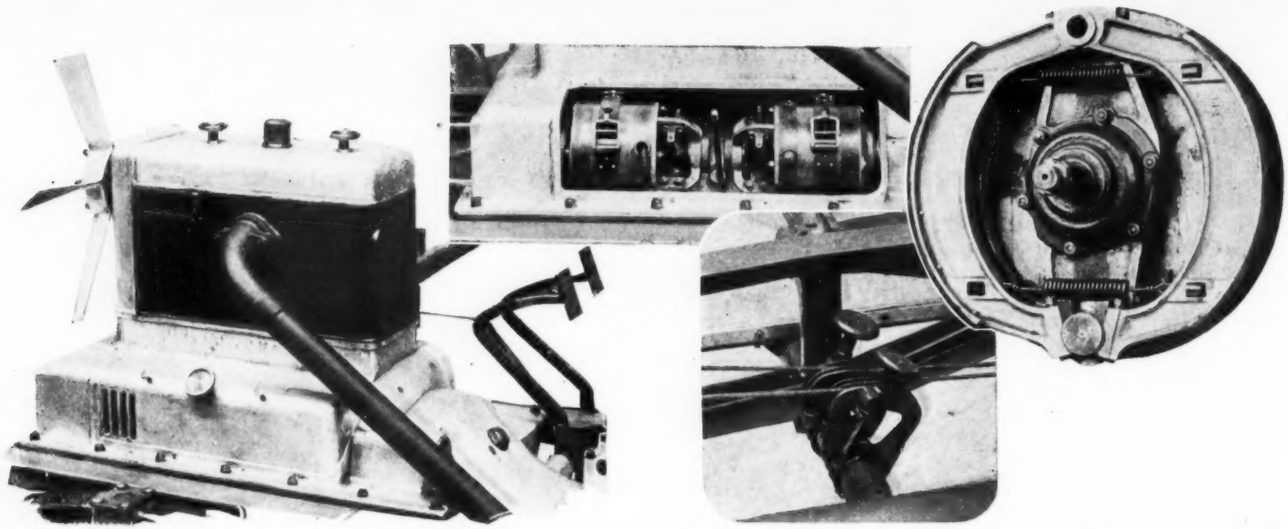
The frame only begins at the rear end of the engine so far as strength is concerned. It is laid out to provide a member for each stress but has nothing to do except support the body, all side stresses are taken up by the tubular cross members and the various brackets







This remarkably short engine has a balanced crankshaft seen in the left view and each crank web has a guard above it made of sheet steel. The guards are linked to the throttle lever and move with the throttle, so regulating the oil supply to the cylinders. The gearset is shown larger on the next page. In the transverse view the generator is seen in its case on the right of the cylinder and the reserve oil tank on the left



Left—Electric equipment side of motor with cover in place. Above—Inset, the cover taken off, disclosing the generator and starting motor. The carbureter draws its air through this compartment via the slots seen in the cover. Right—Brake shoes with taper wedges screw operated, for taking up wear. Below—The intermediate brake shaft with quick adjustment for contracting the brake operating wire cables

each of the plain bearings therein, under pressure. A supply is taken from the tail bearing in the gearset to the corresponding countershaft bush and then returns to the front bearing through the countershaft. Plain bearings are, of course, used for quietness, and their permanent good condition is insured by the force fed oil. The clutch is also fed with oil and to prevent this accumulating in the flywheel housing, gutters are cast on the sides of the casing. These catch any oil that may be flung off from the flywheel and conduct it back to the gearbox. A very clever feature of the clutch is that the central member, which is a single disk covered with an asbestos fabric, is fixed rigidly to a sleeve, which sleeve is an extension of the constant mesh pinion. Thus the pinion slides a little every time the clutch is operated, the teeth being made a little wider than usual to allow this sliding to take place without affecting the meshing of the pinions. The idea eliminates a sliding joint and is a true simplification.

In the gearset it may be noticed that unusual shortness is obtained by making one of the countershaft gears to slide. The sliding gear on the upper shaft gives high and intermediate while that on the lower shaft gives low and reverse.

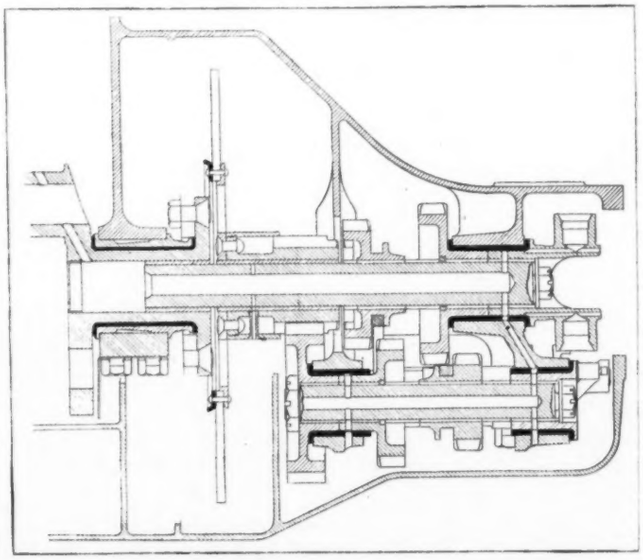
How the Springs Are Oiled

Returning to the lubrication of the chassis, from the engine pump a lead is taken right around the whole chassis, returning to the engine crankcase after completing the circuit. From this pipe every part of the chassis except the rear axle and the steering gear is lubricated. The oil in this main supply pipe is not at high pressure, since there is nothing to retard its flow to the crankcase except the friction due to the bore of the pipe. Also it should be pointed out that the oil supply is not liable to vary very greatly with the weather, since the oil starts on the circuit hot from the engine.

The springs are cantilevers, both front and rear, and oil goes to the fulcrum pins at the center of each spring. Thence oil goes up the hole in the center of the spring and down small grooves cut on each spring leaf. To prevent rusting and exclude dirt each spring is inclosed in a leather case which also covers the slides at either end of the spring, for slides are used instead of shackles. For the front axle radius rods are necessary, and the ball joints at either end of these are lubricated from the springs by taking the overflow through a small pipe to the interior of the hollow radius rod. With respect to the spring leaf lubrication, it should be explained that the oil groove in each leaf is covered by the leaf above it so that oil starting on its journey at the center of the top leaf descends by a series of steps till finally it reaches the extremities of the bottom leaf. To prevent the springs receiving too generous a supply, the hole joining the inside of the hollow spring pivot pin with its bearing is drilled so that it points downwards. To get to the vertical hole in the spring plates and so to the leaves, oil must first pass through the pivot pin bearing, and the hole being downward the weight of the car effectually closes the orifice when the car is standing still. The amount of oil allowed to reach the spring leaves depends upon the amount of work the spring is doing.

Excess oil from the rear end of the rear springs is taken to the brake actuating shafts on the rear axle, excess from the front end of the rear springs going to the equalizing shaft on the chassis, while the oil that seeps from the rear end of the front spring goes to lubricate the pedal shaft. It may be added that oil from the brake actuating shafts on the rear axle finally goes to the axle interior, maintaining the level therein.

The steering gear is not lubricated from the engine but holds within itself enough grease for six months' service.



Detail of gearset and clutch plate shown to a larger scale than in the engine illustration on the previous page

This is usual, but the tie rod and the drag link also hold six months' supply or more, for the ball joints at either end of these rods are fed with oil contained within the tube. On the tie rod near the middle is a screw cap and another is located on the drag link. Removing these allows the tubes to be filled with oil, and this gets to the ball joints through small holes. The cups that grip the balls are held up by strong springs, so the oil cannot leak out, it is merely allowed to seep over the balls and cups when the latter are moving. Throughout this elaborate lubricating system the detail is designed with covers and caps to prevent the escape of oil, and these also serve to prevent the ingress of grit with complete effectiveness.

Not a Question of Expense

The most remarkable thing of all, however, is the fact that all these oil channels, caps and covers are so simple and cheap to make, that the extra cost of the circulating oil supply to springs, etc., is not excessive. It could not be done on a $750 car perhaps, but there is no reason why it should not be part of the scheme of any car costing over $1,500. So far nothing has been said about the lubrication of the hinder end of the transmission. The universal joint gets its oil from the gearbox and is contained inside a ball housing, which takes torque and drive, being the head of a steel tube bolted and clamped to the aluminum axle case. From the universal a small amount of oil is allowed to escape down the torque tube, so reaching the rear axle. Therein it is continuously conducted to the interior of the differential by a fast pitch thread, cut on one of the drive shafts, and from the differential centrifugal force drives the oil to all the bearings. The ring gear picks up the oil in the bottom of the case and a scoop is arranged near the top of the case which catches this oil and leads it back to the thread on the drive shaft, so the axle has an independent oil circulating system peculiar to itself.

On the back of the casing is a dirt trap and a level cock which, it is claimed needs only to be operated every six months, ample precaution being taken to prevent too great a supply of oil reaching the axle.

A Trouble-Eliminating Design

The lubrication system of this remarkable car is not by any means its only feature of particular interest as there are many points besides. It would, perhaps, be well to again point out that the design is based upon twelve years and more of repair shop experience and is entirely colored by that. It is a trouble eliminating design before everything else.

Take, for example the fitting of the starting motor, which engages the flywheel in the customary manner, and of the generator. These are British made units incidentally, and are contained within a casing integral with the crankcase on the left side, corresponding in position to the reserve oil tank on the right side. Over them fits a cover that is detachable like a valve cover plate, and to keep the compartment cool the air for the carbureter is drawn through the casing. Thus the electrical units are completely protected and yet ventilated. Even the spark plugs are covered by a ventilated aluminum case which would prevent water or dirt from reaching the plugs; and a neat detail is that the case has a cut out button opposite each plug terminal so the firing can be tested in a moment by the pressure of a finger without tools and without any risk of shock. Again, the cost of this cover is very small.

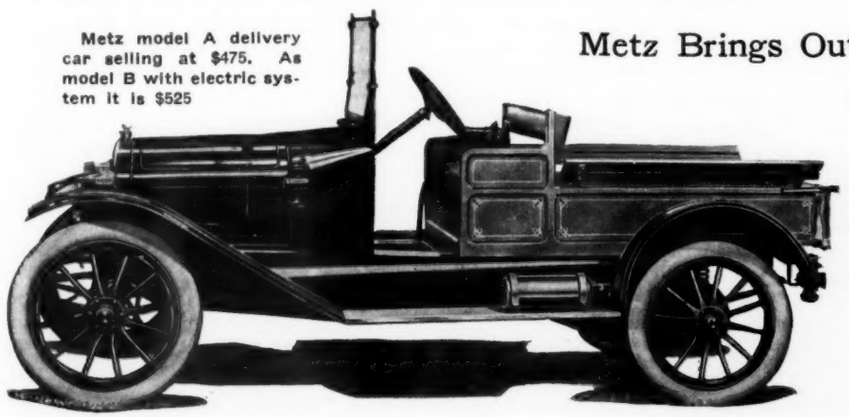
Then take the frame: this is rigid for the length of the motor, in fact the motor is a solid block rearwards from which the frame projects and it has nothing to do except to support the body and the brake countershaft. To give rigidity the section is very deep and is cut out in panels so that it becomes the equivalent of a bridge girder with a member for each stress. It is credited with a rigidity equaled only by the Brush frame, and is at least as light, while there should not be very much difference in the cost. The engine carries the radiator on an extension of the crankcase and the whole power plant sits upon rubber strips, so making a vibration insulating connection with the frame sides.

For fuel supply from the rear end tank a novel system is employed, there being no suction feed and no air pressure. Instead, the exhaust pipe end in a casting of wide, flat section, and this is carried down the back and across the bottom of the tank. The vapor from the gasoline thus created, has sufficient pressure to raise the fuel, once a few strokes of the hand pump have started the flow.

Not a Freak Design

A careful study of the drawings and photographs will disclose many other details of equal originality, but the great importance of the chassis, for it does possess a very great importance, is that it is altogether out of the rut. It is not a freak design as it follows quite ordinary European practice, perhaps it is best described as a good car such as could have been and has been produced by many a European engineer, taken in the rough state and finished off. It is expected of a good car that it will run for years without trouble *if it has proper attention.* Mr. Ferguson has aimed to eliminate that attention. His car can be driven all day and every day for six months without anything whatever being done save pour in gasoline and fill the engine with oil. Not only does nothing else *need* to be done, *but there would be nothing whatever gained in service or performance by doing anything more.*

The idea is so novel that it needs a little mental effort to grasp it, but there is not an automobile driver or user in the world who would not appreciate such freedom from labor. Even the six-monthly task of filling up the steering parts charging the front hubs and testing the oil level in the axle would occupy less time than is taken *every day* by a careful user in going over the grease cups on the spring shackles.



Metz model A delivery car selling at $475. As model B with electric system it is $525

Metz Brings Out Three Delivery Cars

THE Metz Co., Waltham, Mass., has placed on the market three types of delivery cars in addition to its roadster and touring car. All are on a 25-hp. chassis, model A, having an express body selling for $475, with Prest-O-Lite tank and oil side and tail lamps. Model B is the same except that it has Gray & Davis starting and lighting and sells for $525. Models C and D correspond to models A and B, respectively, except that they have roll side curtains, model C listing at $525 and model D at $575. Model E uses the Gray & Davis electric system and has a closed delivery type body. It sells at $600.

New King Eight Is Seven-Passenger

Plain Connecting-Rods Replace Forked Type—Many New Mechanical Features, Including Transmission Brake

FOLLOWING its regular custom, the King Motor Car Co., Detroit, Mich., is announcing its new model just before the national shows. The 1916 car will be built in addition to the 1915 which will be continued with the slight alterations announced a few weeks ago, but the older design chassis will be furnished with five-passenger bodies only, while the new car can be had with seven-passenger touring body, five-passenger roadster or sedan equipment. The price will be $1,350, the wheelbase is 120 in. and tires 34 by 4 in.; equipment, of course, being of the fullest possible kind.

A rearrangement of the springs has permitted the body to be lowered a little and this, in conjunction with most happily chosen body lines, has produced a car of very distinctive appearance. There is a sense of luxury given by the look of the car which is impossible to describe.

Power Plant Is Clean Design

The new motor is 3 by 5 in., giving 282.7 cu. in. piston displacement and is essentially a high-speed type, being geared but a little above 5 to 1 on high. Only a slight amount of stagger has sufficed to permit the use of side by side connecting-rods, these having adjustable bearings of the usual kind. Pistons are Lynite aluminum alloy cast in permanent molds and the wristpins are arranged to rock direct in the pistons. Very special pains have been taken with the design of these pistons so as to render smoking practically impossible and the results are exceedingly satisfactory.

There are three main crankshaft bearings and all oil is forced from the pump through the crankshaft, to the connecting-rod bearings, the pump being situated at the rear end of the crankcase driven off the bottom of a vertical shaft. This shaft has the Atwater Kent distributer with automatic spark advance mounted at the upper end and the driving gears for it are on the extreme rear end of the camshaft, so the distributer comes just in front of the dashboard, in a very accessible position.

The front end has a silent chain drive, with adjustment on an idler with eccentric bushing between the generator and the crankshaft, this giving a triangular main drive with separate chains for camshaft and generator. The generator lies snugly beside the crankcase where it cannot interfere with the accessibility of any other part. With the generator in this location and the distributer at the back end, the valve alley is clear of everything except the carbureter, which, by the way, is a special King design.

Combined Intake and Exhaust Manifolds

A very neat idea in connection with carburetion is the combination of intake and exhaust manifolds, these being cast in one, as shown in the halftone illustrations. The compound manifold provides the necessary warmth for the gasoline without the complication of a water-warmed manifold or a carbureter jacket.

Another feature which is unusual and also makes greatly

for accessibility is the position of the starting motor, this being mounted on top of the clutch housing, meshing with a flywheel ring gear in the usual way. Both the generator and motor are made under Ward Leonard patents and the battery is a Willard.

For cooling, the thermo-syphon system is employed, this being particularly efficient in V-motors, owing to the low position of the cylinders relative to the radiator, and it is noteworthy that the exit pipes from the cylinder blocks are so arranged that the water has a particularly free circulation around the valves.

Tire Pump on Gearset

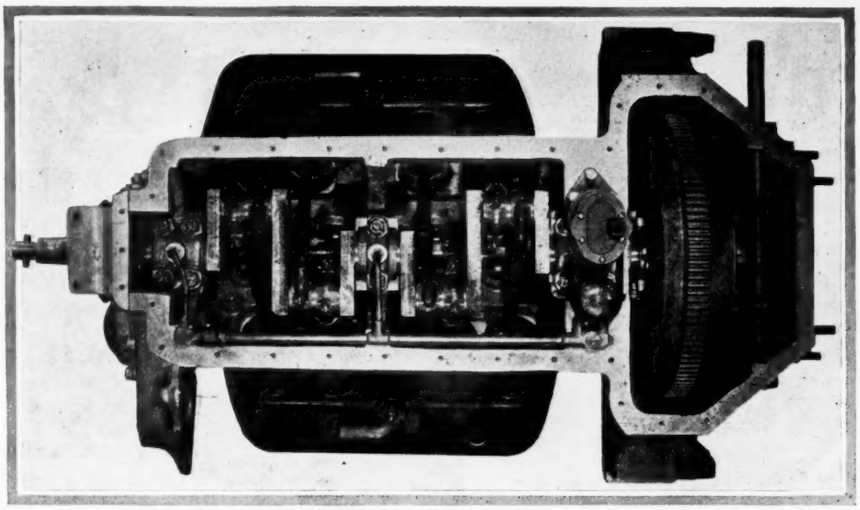
On the side of the three-speed gearset the tire pump is mounted, this having a sliding gear that meshes with one of the countershaft transmission gears when the pump is in use. In this place the tire pump is out of the way and cannot interfere with any engine accessory, while it is just as convenient for use.

Transmission Brake Used

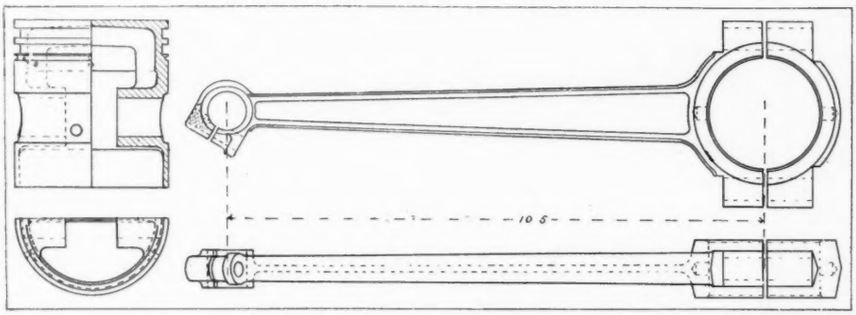
Behind the gearset, mounted on the tail end of the main shaft and embracing the universal, is the transmission brake, which is linked to the emergency lever and has abnormal power. It is a simple type of band brake with toggle actuation needing very few links between the brake and the lever, while the release springs are arranged in such a way that dragging on the drum is impossible. A substantial casting which bolts to the back of the gearbox carries the fulcrum pin of the brake. Aft of the brake is an open propeller shaft with a universal at each end, there being a short torque stay arranged to divide the angular bend equally between the two joints, according to the proper principles of universal joint layout explained by C. W. Spicer in his recent S. A. E. paper. The driveshaft is tubular and so long that the joints have but little work to do.

Rear Axle Light

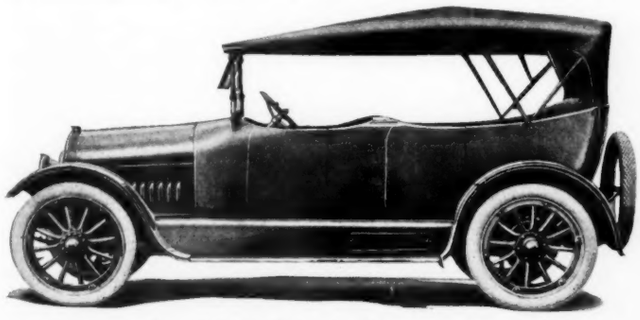
Owing to the use of a transmission brake, the rear axle is particularly light and neat, having no brake rods on it as the contracting service brakes are operated by direct pull rods from the cross-shaft. The latter has no balance beam, but the natural elasticity of the rod gives an equalizing effect. Spiral bevel drive is employed and the axle is a full-floating type. The long cantilever springs are clipped beneath the axle and transmit the drive to the swivel brackets, the front ends of the springs being shackled. For the frame a very strong section has been selected of unusual depth, and the principal cross-member is made of the crankcase arms at the rear of the motor; in front there is a dropped cross piece which supports the front end of the power plant and the radiator.



Bottom of crankcase of the new King, showing details of the crankshaft and connecting-rod mountings. Note lubrication to main bearings. Also silent chain front end drive



Details of piston and connecting-rod design in the new King. The pistons are Lynite aluminum alloy cast in permanent molds. The wristpins rock direct in the pistons. This is the short piston of hourglass type credited as being proof against smoking



The new King eight-cylinder touring car selling at $1,350

Luxurious Bodies

Internally, the body is in keeping with the luxurious appearance already mentioned. It is finished in the best possible style and upholstered with a lavish use of stuffing and leather. A detail of equipment immediately noticed by anyone acquainted with other King models is the absence of the folding steering wheel, but a trial soon shows that the new body gives so much room that the largest driver could easily enter from his own side. In the tonneau, the folding seats vanish into the back of the front seat, when folded, and when unfolded, are found to be upholstered as well as the other seats and large enough for real comfort.

Acceleration Is Good

A short trial over good and bad roads close to the factory showed the car to be exceptionally well sprung, and that the acceleration on high gear was entirely up to the modern high standard. The engine is noticeably free from vibration and runs very sweetly indeed, being practically soundless except for a not unpleasing exhaust hum.

It is noteworthy that the controls are all arranged conveniently to the steering wheel and that the steering is light in action.

The History of the American Automobile Industry—7

Bullard's Steam Automobile the First Steam Vehicle to Have Automatic Control of Its Essential Functions—Very Light—Wire Wheels Used —R. E. Olds Begins Work on Steam Cars

By David Beecroft

SECOND to Lucius D. Copeland as a pioneer developer of steam motor vehicles came James H. Bullard of Springfield, Mass., who began the construction of his first steam automobile in that city in 1885. Mr. Bullard first designed a cylindrical boiler with fire tubes through it lengthwise and charcoal or anthracite fuel. At first intended to be inclined, this boiler was later sketched vertical with the engine mounted directly upon the boiler shell and driving the wheels by means of a pinion on the crankshaft meshing with the gear on the driving axle at its center. This engine mounting is interesting because used by a number of later constructors, but this design was not built by Mr. Bullard, who gave preference to a horizontal engine mounted over a horizontal boiler and placed at the rear of the driving axle. The engine had two cylinders and the driving axle was the forward one, the driver's seat being practically over this driving axle and there being two small steering wheels at the rear. The construction was begun in 1885 and continued throughout that year and most of 1886. The cylinders were slightly under 3 in. bore by about 4½ in. stroke with cranks at 90 deg. The valves were of the oscillating type and with no provision for reversing. A bevel gear differential was used and a clutch provided around this differential so that the vehicle could coast without turning the engine.

Wire Wheels Used

The driving wheels were of the wire spoked type used in bicycles at that time and about 50 in. in diameter. The rear steering wheels were also bicycle wheels of about 14-in. diameter, all fitted with solid rubber tires. The wheelbase was about 4 ft. and the gage 2½ ft. A handlebar steering controlled these rear wheels which were provided with such steering arms to make them track properly when turning corners. To avoid twisting the mechanism, the steering axle was provided with a horizontal king bolt which permitted one end of the axle to rise and fall without twisting the frame, a device that found much favor with the early inventors, who were as likely to overestimate difficulties in their inexperience as to underestimate them.

The hand wheel of the throttle valve was brought forward under the seat to a point where the operator could reach it and the brake shoes bearing on the rubber tires were applied by pedal. The seat was wide enough for a single person only.

The first experiments indicated the unsuitability of the cylindrical boiler and solid fuel so experiments were begun to develop a faster steamer and some form of liquid fuel burner. A flash boiler arranged to be kept hot by kerosene wick lamps and to instantly convert water into steam when the pump supplied the water was next tried, but without reasonable success. He next tried a porcupine type of tubular boiler holding about 1½ gal. of water, which worked well when sufficient heat was provided. The wick fire could not be forced sufficiently, so many experiments were made in the attempt to burn kerosene without smoke. Bullard persisted, however, deviating only once to try alcohol in a surface burner, but this did not give sufficient heat and the whole device caught fire. Finally the idea of atomizing the oil was tried with a small atomizer, which showed that a very hot flame free from smoke and consuming a large quantity of oil could be produced in a very small space. This discovery was followed by many weeks of experiments devoted to working out details of tanks, burners and regulating devices to the end that the supply of oil, the compressed air, the supply of water and similar necessities should be automatic, leaving the operator free to devote his attention to the road. The steam pressure regulated the amount of fire, shutting it off entirely when a certain maximum was reached, a pilot fire burning constantly being ready to light it up again when the steam fell below a certain minimum.

Automatic Control Features

This was the first steam vehicle of any kind to have automatic control of its essential functions, and patents were secured covering all the novel features. This vehicle was successfully operated in Massachusetts during the summer of 1886. The runs were all short and generally took place early in the morning in order to avoid interference with other traffic and to prevent accident, due to frightened horses. The complete vehicle was very light, being easily lifted by two men. Its maximum speed and power were not taken but it would easily

go as fast as any one cared to ride on ordinary roads of that time.

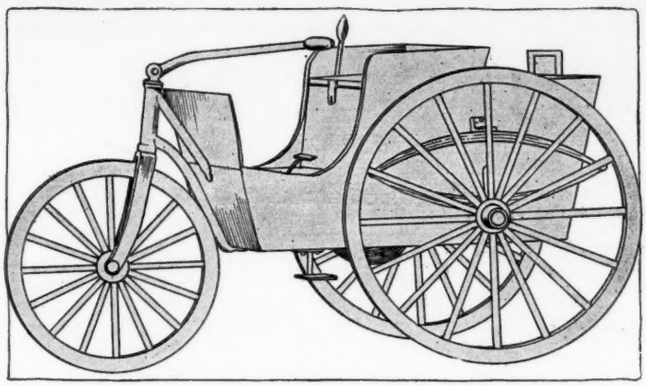
Mr. Bullard's process of burning oil was found to be adaptable to many other lines of business in which a perfectly clean fire of high temperature was necessary, and a flourishing business grew out of the method of atomizing oil by air pressure and burning it under steam boilers and in furnaces for forging, welding and melting metals in brick and pottery kilns and in glassworks, all with highly satisfactory results as to quality of product and economy of operation. Bullard took up the steam vehicle again in 1898 in connection with A. H. Overman of bicycle fame, but this later effort will be considered in a later issue.

The James H. Bullard motor vehicle patent shows a two-cylinder, horizontal steam engine, although it is not known that Bullard was aware of Copeland's work, but probably he was. The H. B. Smith vehicle, patented Feb. 26, 1889, which patent was filed about six weeks after Copeland's patent was issued, undoubtedly reflected Copeland's enthusiasm because the Smith Machine Co. were makers of the Star bicycle to which Copeland first successfully applied his motor. It is claimed that the Smith machine was completed in 1885, the patent being filed within 2 years after its completion. This machine much resembled the one shown in Copeland's patent in that it had two large rear wheels and a single front with the boiler mounted on the reach but this reach was at the side, making a two-track vehicle instead of a three-track one, as was Copeland's. No pedals were provided, which Copeland's patent showed. Both two and three-track tricycles were common in those days, so this choice has no significance.

The Smith vehicle used 48-in. rear wheels, a then common size, with 1¾-in. cushion tires and probably weighed 500 to 600 lb. The boiler was tubular and of copper, heated by fuel oil carried in the hollow frame and sprayed through a burner. The gears provided two rates of speed of 4 and 12 m.p.h., respectively, and the single-cylinder engine was able to drive the vehicle at the higher speed even on the Jersey roads which were heavy and sandy.

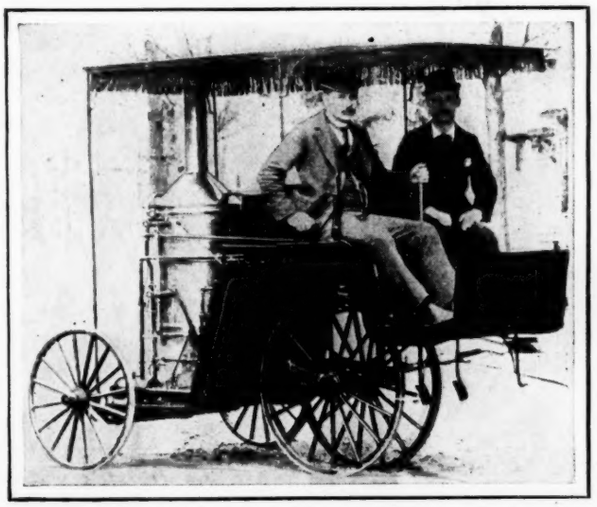
R. E. Olds Begins Experiments

Ransom E. Olds' introduction to mechanical life came at the shop in Lansing, Mich., where, with his father, he was engaged in building small portable steam engines, having started in 1880, under the name of P. A. Olds & Son. Like many others, he had the idea that the power-propelled vehicle could be a success and about 1886 or 1887 began a small three-wheel buggy driven by a little steam engine and boiler completely inclosed in the enlarged buggy box on the front part of which the seat was perched. The single front wheel was carried in forks like a bicycle wheel and steered by a tiller lever. The only picture extant is probably a drawing produced from memory and does not give essential details. As first made, the variable lever and ratchet drive was employed but as this transmits the power by a series of very disagreeable jerks, it was abandoned and later chains and gears were tried. The wheels were steel tired and about 4 ft. in diameter which was the usual carriage size. As rebuilt, a clutch was provided to disconnect the engine from the wheels, the seat was wide enough for three and the weight about 1500 lb., or somewhat heavier than the little steamers so common 15 years later. It could run as much as 10 m.p.h., but was quite noisy and was usually operated on the streets of Lansing in the latter part of 1887 about 3 or 4 o'clock in the morning before other street users were about, to avoid frightening horses. So little promise did this machine hold forth that it was dismantled and the matter dropped for several years.



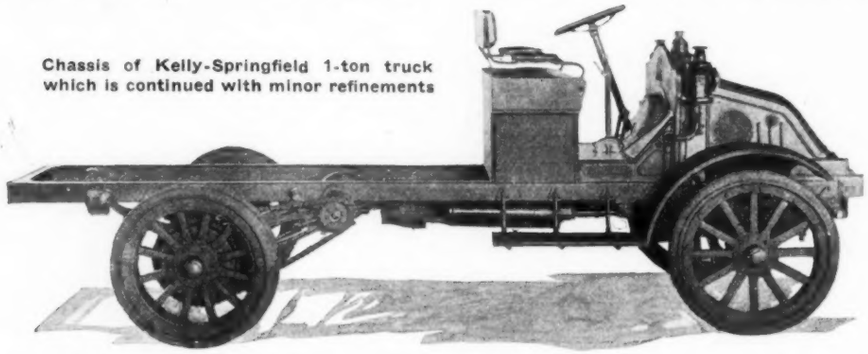
Three-wheel steam buggy designed and built by R. E. Olds in 1886 or 1887. The engine and boiler were inclosed in the buggy box on the front of which the seat is located

About 1890, using the former rear wheels and axle, Olds again attacked the problem. This attempt was actually running before May, 1892. It had a vertical boiler, carried on a low, rear platform so as to not project too high, while the passengers were seated in front of the boiler and over the front wheels, which were double but placed so close together as to steer like a single wheel. This vehicle, evidently, was the subject of considerable changing and experimenting and was eventually sold to go to Bombay, India.



R. E. Olds in his second steam car built about 1890. Note the double front wheel steer. The same rear wheels and axle were used in his first design

Kelly Line Increased To Seven



Chassis of Kelly-Springfield 1-ton truck which is continued with minor refinements

Models Added Have Capacities of 1½, 2, 4 and 6 Tons— Minor Refinements Also Made

SEVEN models make up the 1916 line of Kelly motor trucks manufactured by the Kelly-Springfield Motor Truck Co., of Springfield, Ohio. These trucks are known as K-30, K-31, K-35, K-40, K-45, K-50 and K-60. Of these, K-31, K-35, K-45 and K-60 are new. With the exception of the additions no marked changes have been made in the policy of this concern for this season. At the same time, a number of improvements and refinements of a minor nature have been incorporated.

Two Motors Used

Following the practice of a year ago, two motors are used. A smaller size known as the K-30 is used in the 1, 1½ and 2-ton models which are known respectively as K-30, K-31 and K-35. The larger model is known as the K-40 and is used in the 3½, 4, 5 and 6-ton chassis which are named in accordance with the respective lettering given above.

The improvements include a new carbureter which is now the latest Rayfield, in place of the design formerly used. Another improvement in the motor consists of the lower half of the crankcase being cast in two seperate pieces with the bottom part forming an oil reservoir of 2.75 gal. capacity. This is covered entirely with a screen which allows a straining area of approximately 2500 in. Beyond these, no noticeable alterations in mechanical features have been made.

The small motor known as the K-30 is a 3¾ by 5¼, L-head block design, with the valves on the right side and inclosed. The larger motor is a T-head design cast in pairs with a bore and stroke of 4½ to 6½, with a nominal rating of 40 hp. The S. A. E. ratings of the two motors are respectively 22.5 and 32.4 horsepower.

Oil System Partly Revamped

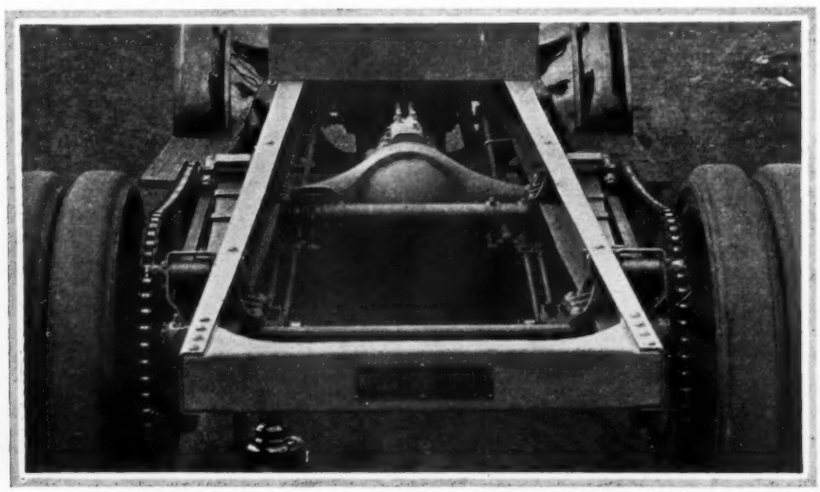
While part of the oiling system of these motors has been revamped, as explained it is still practice to keep the oil pump in the bottom of the reservoir in such a location as to secure only strained oil. The crankshaft of the motor is hollow as it was last year and the oil is forced through this to the lower connecting-rod bearings.

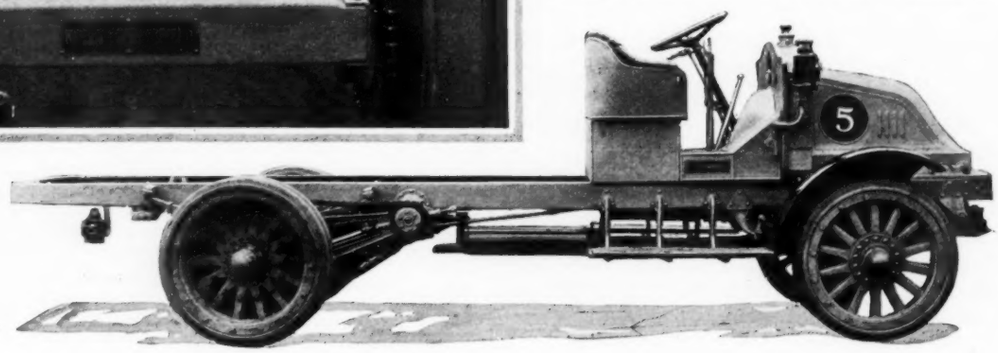
Final Drive by Chain

Power is taken from the motor by a cone clutch to a three-speed selective gearbox located amidship. Final drive is by double chain to the rear wheels. The springs are semi-elliptic, front and rear. The lower end of the drop-forged radius rod is forged to the brake spider, the forward end being held by means of an adjustable radius-rod block to the ball end of the jackshaft housing. With this construction the braking strain is thrown upon the radius rod which is especially designed to take up the strain of braking torque. With this system of construction there are no rigid cross members, the frame being allowed to absorb the strains and shocks.

Radiator Mounted on Springs

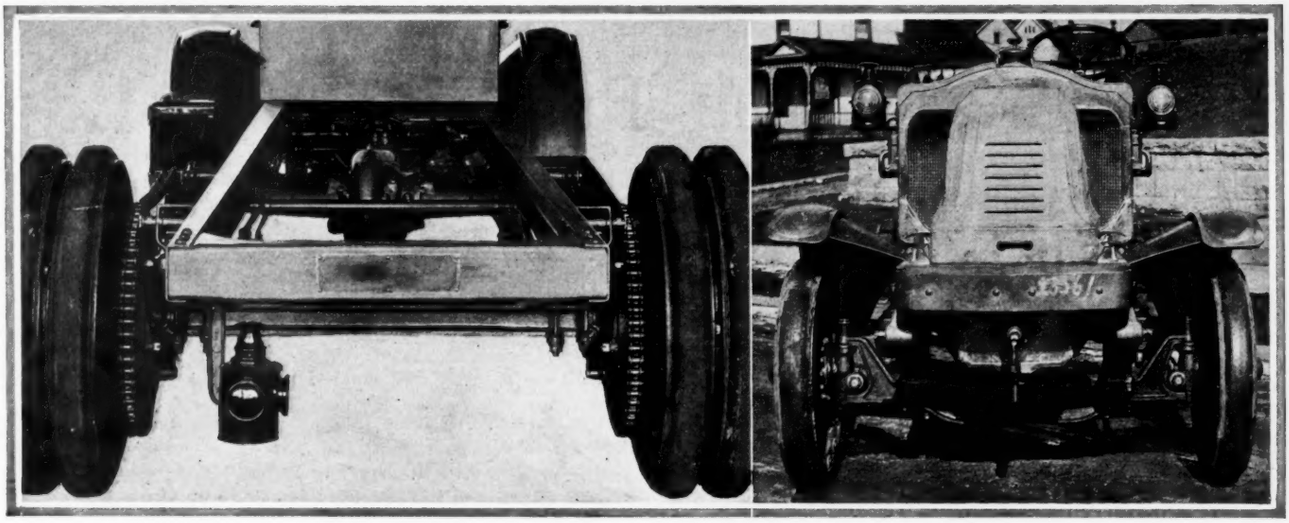
One of the distinctive features of the Kelly truck is in the mounting of the radiator which is behind the motor and in front of the dash, although independent of the dash. It is carried on four sets of springs which are allowed full freedom of





Above — Rear of the Kelly-Springfield 5-ton truck showing the drive and suspension units

Right—Chassis of Kelly Springfield 5-ton truck



Left—New K-35 2-ton Kelly-Springfield chassis which has been added to the line this year. Right—Front view of Kelly-Springfield chassis showing typical bonnet and radiator appearance

movement and absorbs the road shocks before they reach the radiator. The prices of the seven trucks are as follows: K-30, 1-ton, $2,000; K-31, 1½-ton, -2,050; K-35, 2-ton, $2,750; K-40, 3½-ton, $3,400; K-45, 4-ton, $3,600; K-50, 5-ton, $4,250, and K-60, 6-ton, $4,500.

Different types of bodies are interchangeable on the same chassis size, thereby rendering it possible for the owner of one of these trucks to have a vehicle suitable for many different kinds of work. The body equipment is as complete as on the models on the market for the past year.

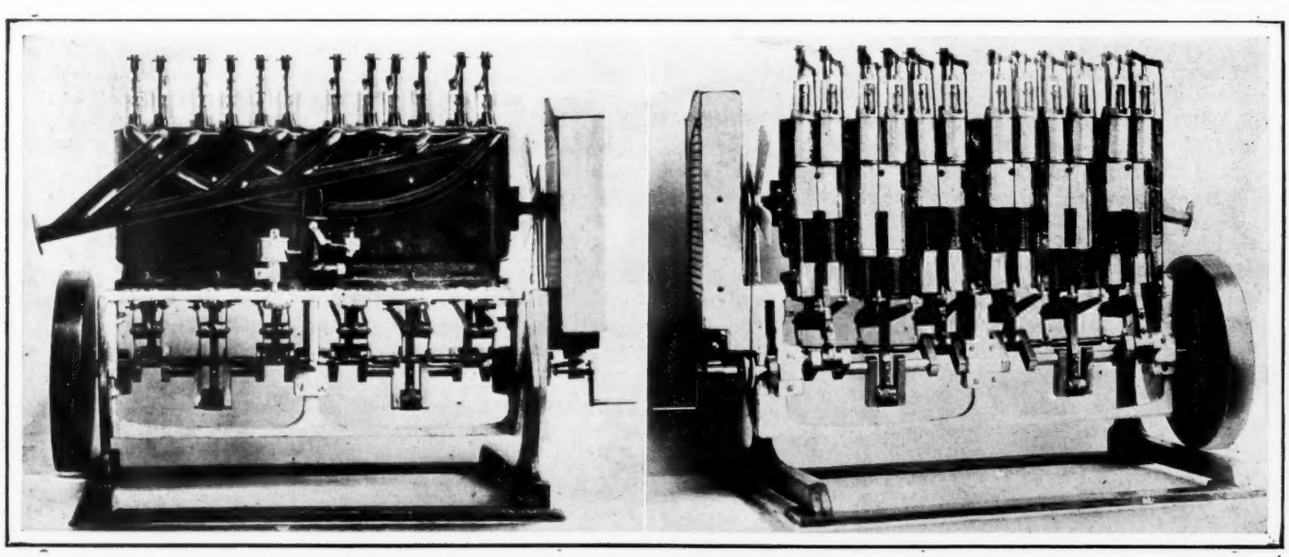
Model for School or Motion Picture Study

IN order to provide an instructor's model at low cost, A. B. Calkins, a mechanical engineer of New York City, has brought out a series of longitudinal motor section models made of low-priced materials such as wood, etc. This series of models, while light, are of sufficient sturdiness to withstand the ordinary usage of the classroom and at the same time can be operated by a small hand crank in such a manner as to show the operation and functioning of the various elements of the motor.

It is common practice in most of the motor schools to employ cut models showing the working parts of different types of motors. To cut these models from the materials used in actual motor manufacture is an expensive undertaking, and hence the use of the model has been more or less restricted. With the Calkins model the objection of great expenditure is overcome and at the same time it is quite feasible to make all the working parts of the motor visible by using a complete cut longitudinal section.

The accompanying illustration shows a model of this description which is to be put on the market especially for automobile schools. The particular model shown is a six-cylinder, four-cycle design with overhead valves. A magneto timing gear is furnished with this model and along with the model is a short treatise on power calculations.

Another use for models of this type is the taking of motion picture films, and it is one of the inventor's ideas that technical schools can be supplied with reels suitable for the lecture room for any discussion of the action of a motor.



Exhaust and intake sides of the Calkins motor model for school or motion picture study

Protecting Finish Prolongs Car Life

Good Paint and Varnish Essential—Must Be Skillfully Applied—Good Materials and Workmanship Real Economy—Getting a High Polish—The Dull Finish

By M. C. Hillick

WORKING in co-operation with steel, aluminum, wood and such other things as are usually squeezed into the make-up of the automobile, good paint and varnish confer the lion's share of benefit upon the vehicle. The metal may be rough, and in its undressed state far from a thing of beauty, but under the magical effect of paint and varnish it becomes transformed into something good to see. While the appearance of the car is rounded out, and the grace of the fashion of it emphasized by the application of suitable colors, and the employment of a mirror-like finish, the real mission of the painter's work is to furnish the last full measure of protection to the surface of the car.

The extent of that protection, then, rests primarily upon the quality of the materials entering into the finish. By whatever margin the protection falls short of what it, in all fairness, ought to be, by that margin the quality of the paint and varnish mediums fails to meet a right standard of requirements. In this quality—this superior brand of excellence—the car owner, first of all, should have a deep-rooted interest.

Economy to Pay for Good Materials

It is economy to pay for the use of such materials for at least two reasons. First, they wear enough longer, and furnish the needed protection while wearing, to more than equalize the difference in cost between superior and inferior stock. Second, the car is shopped less frequently, thus furnishing more protracted and more efficient service, and less overhead expense, due to idleness in the shop.

Then there is the additional advantage—shall we not say additional profit?—derived from the finer appearance, the more luxurious appointments, which are part and parcel of the practice of using a class of paint and varnish stock strictly above suspicion. A high grade of material is not all, however. United with it—an indivisible part of it, in fact—must be an equally high grade of workmanship. The finest paint or varnish to be found anywhere counts little if applied by an incompetent workman. All the value combined in its make-up by the most scientifically adjusted methods of manufacture go for naught when the craft muddlers lay unskilled hands upon it.

Up to the Car Owner

It is, of course, the business of the painter to see, among other matters, that good materials and workmanship are furnished. Nevertheless, this is not always done—or, at any rate, not nearly so well done—unless the car owner evinces an interest in, and a knowledge of, the painting system employed and its possibilities for furnishing a finish for which no apologies will be required.

In the purchase of clothes and of motoring necessities in general the average car owner is both fastidious and exacting. Why not in buying what the painter has to sell insist upon an article of uniform excellence?

It adds substantially to your motoring pleasure and comfort. Moreover, it adds to the life of the car and thus indirectly serves your bank account a good turn. A recent article in THE AUTOMOBILE has stated, in effect, that the improvements which have lately been made in the manufacture of sheet steel are of such a nature that the metal is more subject to corrosion than formerly. This condition, therefore, makes the need of regular, systematic painting and varnishing, performed decently and in order, increasingly urgent.

Lacking the necessary protection the parts of the car often most in need of it become exposed to the weather, and corrosion immediately begins to gnaw at the vitals of the finish.

Rust Ruins Many Cars

A well-known automobile engineer has said that more cars are every day going to the scrap heap through destruction by rust and corrosion than from any other cause. The weakness and decay of metal through the action of rust and corrosion are becoming widely recognized.

To such an extent is the damage resulting from these agencies feared by railroads which within recent years have become large owners of steel passenger cars that special instructions have been issued to keep every fraction of metal well coated with paint specially adapted to steel protective purposes.

Clean and Varnish Twice a Year

The automobile in regular use should be cleaned up and varnished at least twice a year.

The word varnish does not exactly convey the meaning of the labor involved. Before applying the varnish the car will need to be cleaned up carefully, both body and chassis. Remove all grease and lightly rub the surface of the car body with pumice stone, flour and water. This practice gets away with any lingering traces of grease or foreign substances, and puts the film of old varnish in a receptive condition. Next, all defects in the finish, all blemishes of the color, and surface disfigurements in general, need to be touched over lightly and thoroughly with color matched to meet that upon the car.

This work calls for skillful brush use and good judgment. The match color under the most favorable conditions, and produced by a colorist of the best type, will fail possibly a trifle in being precisely the same shade as the old, for which reason the least used the better. In touching up, the painter may well be admonished to cover no surface beyond the actual defect. This touching up had best be done with a small lettering or striping pencil so that not only a very small quantity of color is used but that rough, coarse edges may be avoided.

Varnish Will Not Conceal Splotches

Thick splotches of color cannot be successfully concealed under one or two coats of varnish, or for that matter, under any number of coats, so the essential thing to do is to apply

the color sparingly and with a satiny smoothness. All this makes for the best possible sort of finish.

A New Coat of Color

Frequently the finish is in comparatively good condition but with the color showing such a faded, disfigured condition that the only means of restoration consists in giving the entire surface a coat of color, running the ornamental lines over this, and then in due time applying the coat of finishing varnish. In many cases this process is practically as quick as the touching-up method, and scarcely more expensive. In the matter of appearance and finish it is in every way superior to the touch up and varnish practice, this latter feature being the one that, above all others, really commends itself to the car owner. There are many things connected with this touch up and varnish, or the one coat color and one coat varnish job, which the car owner should not let the painter forget.

Radiator Needs New Paint

The radiator, for example, should always get a fresh smear of paint. A thin, tough coat of paint—one that under heat holds its luster and shines on with the tenacity of a new moon. The fenders need to be finished with a hard drying finishing varnish. All defects, and parts which do not compare favorably with their surroundings, or with the finish in general, should be touched up with the proper color, or with varnish color, in a way to enhance the finish and balance the appearance of the car up to something approximating that given the best class of work.

Clean the Natural Wood

Not a few automobiles are being let out of the shop with the natural wood finish on the inside of the cars soiled and darkened to a condition detrimental to the appearance of the interior appointments. Wherever the finish is thus found the varnish should be taken off either with paste varnish remover or with steel scrapers, completing the operation by sandpapering with No. 1 sandpaper. Then apply a solution of oxalic acid which in the course of a few minutes will bleach the wood and restore its original color effects. Then rinse off with clean water and follow the evaporation of the moisture by a thorough sandpapering. Next proceed to fill the wood with a good mineral filler colored to meet surface requirements. Let the filler, after application, dry for 24 hr., and then apply two coats of orange gum shellac, sandpapering each coat carefully. A couple of coats of rubbing varnish, and one coat of finishing varnish, will then restore the natural wood finish to its proper sphere in the general finish of the car interior.

Some parts of the interior of the car, if not all, had best be given a rubbed and slightly polished finish. Door casings, door edges, stiles, and such other parts as are subject to considerable handling, will present a much finer appearance if so finished. All these parts are to be brought through with the necessary coats of rubbing varnish. The final coat should be a good grade of polishing varnish, freely applied.

Finishing Up the Surface

In due time rub this coat with pulverized pumice stone and water, then with rotten stone and sweet or crude oil, after which go over the surface with the palm of the hand, rubbing smartly until under the friction so generated a moderate polish is developed.

For a Higher Polish

In the event of a higher, brighter polish being desired, the surface after rubbing with oil and rotten stone may be polished by using a tuft of cotton or tow dipped in some approved make of varnish polish. The polish is a result of friction and this friction can best be developed by holding the tow or cotton in one shape until it becomes matted down and saturated with the polishing material to such an extent that in working it back and forth across the surface a sharp creaking sound is made.

A surface finished with this class of polish can be handled with impunity, and without leaving any visible signs of being "mussed up." For the closed cars in which it is desired to create an effect of real elegance coupled with creature comforts, with such effects to be maintained at their best at a minimum cost, the rubbed and polished finish offers advantages quite out of the ordinary.

The Interior Finish

More attention is being paid to the finish on the interior of the car, and to all interior appointments, than ever before. The rubbed finish either in the popular dull effect, or in the full polish luster, furnishes a maximum of value at a minimum maintenance cost, and confers the luxury of the drawing room upon the interior of the car.

The Dull Finish

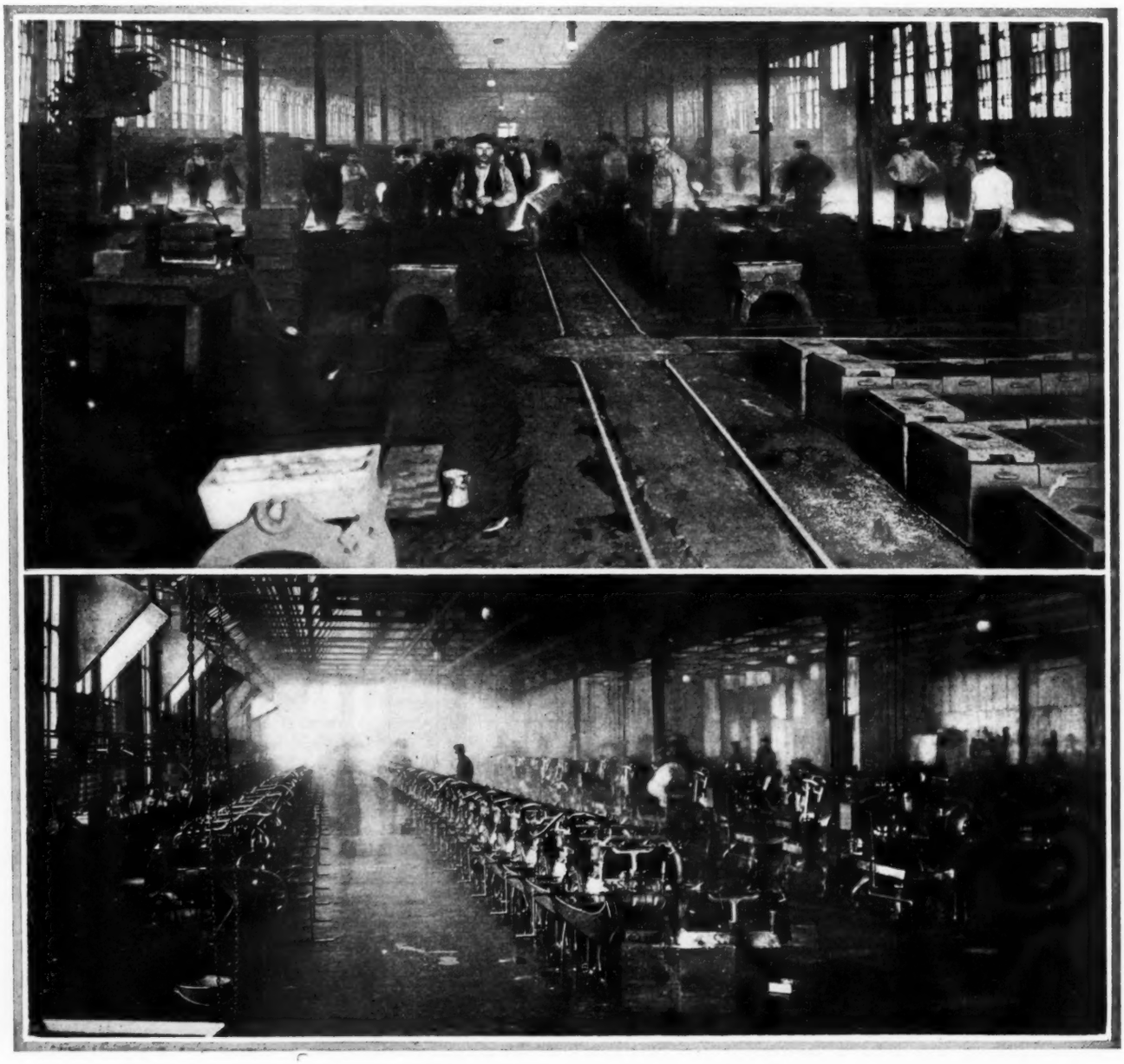
What has been stated with reference to the dull finish for the car finish applies also to the exterior. Everywhere the dull or "no-luster" finish is being exploited. This finish is being in some cases—in many cases, perhaps we should say—developed through the employment of enamel or flat drying paints. The best and most durable dull finish, however, is produced by bringing the exterior body surface up with the usual quota of varnish coats, and then rubbing the finishing coat to a dead, or an eggshell gloss effect.

Dart Makes Special Jitney Body

A SPECIALLY designed jitney bus body has been mounted on the Dart model C 144-in. wheelbase chassis. The chassis alone lists at $1,800 and a body 140 in. long at $750. The body is richly upholstered throughout and has push buttons as signals for the driver and dome lights. It is lighted from a Westinghouse generator and storage battery. The motor used on this car is a Buda 4⅛ by 5½ four-cylinder.

Another jitney bus built as a ten-passenger body fitted for any of the Dart chassis is shown herewith. This is known as model A and has the seats running lengthwise and the machine equipped with top and curtains for bad weather. This style car sells for $1,000 on the model A chassis, model B fourteen-passenger, sells for $1,633 and model C, eighteen passenger $2,105. The seats may be removed and the cars transformed into livery rigs in 5 min.

First and Last Stages in the Building of Buick Motors



THE factories of the Buick Motor Car Co., in Flint, Mich., are ever a source of interest to the visitor. In the views above are illustrated two vistas in the big factories, the upper showing metal being poured into the waiting moulds in the foundry department, and the lower giving some idea of what it means to test enough motors to take care of a 42,000 automobile output.

The motor casting part of the Buick factories is a building 526 feet by 80 feet, making an available floorspace of 1 1-2 acres. Nine million dollars is the sum annually expended in the payroll of the casting department which employs between 325 and 350 men in the making of all sorts of castings which go into the makeup of the car. The work of the department is not confined to iron castings, as it also makes aluminum gearcases, crankcases, etc., as well as iron cylinders, pistons and the like.

The motor testing department is always an interesting feature of an automobile factory. It impresses the observer as being peculiarly indicative of the feverish activity of the whole plant. Here is concentrated all the power which many other departments are storing up, so to speak, as they add each part to the embryo motors. The Buick motor test room contains 200 test stands and there are complete facilities for putting each engine through its paces to the satisfaction of the inspectors. All adjustments are made and the power plant tuned up to its maximum productive pitch before it passes inspection and goes out into the world to rely upon its own powers.

The motor plant is 782 feet long by 360 feet wide, and is said to be the largest in the world devoted exclusively to construction of automobile engines. It covers 6.46 acres and in it the engines grow from a miscellaneous collection of parts to the finished state ready for transference to another building where they meet the chassis. The motor machine shop in this building contains 683 machine tools, representing an outlay of $800,000, and employs an average of 1,400 men. It can turn out 250 motors a day.

Data on Mixed Motor Fuels of Interest for American Export Trade

¶ *Under this title the first portion of Baron Von Loew's road tests with fuels composed mainly of benzol and alcohol in different proportions was printed in* THE AUTOMOBILE *of Oct. 14, and the importance of these tests for the American industry was explained. The following additional report amplifies these data, and a third report is still to come in which the author will account for the improved acceleration obtained with pure alcohol or fuels very rich in alcohol by narrowing the air channel around the jet of the carbureter.*

Other data very closely connected with the same subject were furnished in THE AUTOMOBILE *of Aug. 12 under the title:* "Car and Carbureter Design Suitable for Driving with Any Fuel" *and in the issues of July 29 and Aug. 5 under the title:* "Analysis and Valuation of Motor Fuels—14 Methods of Examining Them."

No material of equal value to the automobile industry and automobile owners on the subject of motor fuels in its relation to motor design has been collected anywhere else. It gives clues to a desirable independence of the petroleum supply not only in a hazy future but at almost any time when technical and active organization for that purpose is undertaken, and it opens extensive possibilities for a larger trade in automobiles in all those tropical regions of the earth which are now developing so fast industrially but where gasoline can never be as desirable a fuel as hydrocarbons of lesser volatility provided these are made suitable for use on equal terms of efficiency and convenience. Careful reading of the articles referred to will disclose their relations to American business and business prospects with such detail, precision and anticipation of objections as cannot be conveyed in a few general words. The problems still involved have advenced toward their final solution in a much more definite and practical manner than those relating to the application of the Diesel system to motors of light weight—which represents the only competing possibility in sight for gaining independence of the petroleum market and of the very considerable fluctuations in the composition of the available crude petroleums. The exclusion of Mexican wells from the market supply, for example, is even at this moment held accountable for a rise in gasoline prices, less by reason of the quantity excluded than on account of the less suitable composition for gasoline distillation of other raw materials, just as Russian petroleum has so far been effectually barred by its large hydrogen content. While not yet as pressing as in Germany, the interests to which these data relate in the United States do not, therefore, belong to a remote future but may at any time assume the greatest practical importance. Motors suitable for being operated with any fuel from pure gasoline to pure alcohol or kerosene may be in strong demand in two or three years not only for export but even for the domestic automobile trade.—M. C. K.

Please correct typographical error on page 711, issue of October 14. Under Table 10 read: "Hill-climbing trial-runs with ½ liter of fuel" instead of: "Hill-climbing trial-runs with ⅓ liter of fuel."

Driving Tests with Benzol-Alcohol Mixtures by Baron Von Loew—II

IN tables presented in the first parts of this report the capacity of the test car for acceleration and for sustained pulling with different fuels and with the motor developing its maximum of power has been shown for two different road formations and in the variations to which it is subject. Similar speed trials and comparisons have been made in numerous other places, and some of them throw special light on the fuel values. Details are given in the following.

For many tests it is of special interest to have them carried through with the motor working at the limit of its power. With my test car (Horch car, Audi works, 4 cylinders, 90 millimeter bore and 140 millimeter stroke, weight 1356 kilograms) this condition cannot be realized in practice except on a very steep road with little traffic, as on ordinary grades it easily reaches speeds which interfere with the traffic and therefore cannot be sustained. For this reason, as already mentioned in the previous account, the longest and most decisive tests at maximum motor power were made only on the steep road from Wiesbaden to Hohe Wurzel, the profile of which is given in the accompany illustration. As also mentioned, the first trials were made with 1 liter of fuel and began at kilometer-stone 3.9, while the later trials were made with only ½ liter of fuel and began at kilometer-stone 5.5. The most suitable places for comparing the speeds obtained under different fuel conditions are at kilometer-stone 6.5, the shortly before kilometer-stone 6.8, the exact place corresponding to about 6.75. On account of the gentler gradient after the 6.3 stone the speedometer registers highest at stone 6.5, and thereafter it drops at once rapidly, until shortly before stone 6.8 it is at its lowest. After this point the grade of the road is easier and the speedometer hand rises again. At the ½-liter trials previously mentioned the fuel often gave out before point 6.75 was reached, and any publication of the speed figures obtained could therefore only have been fragmentary. Other trials were therefore made, on Aug. 9 and 10, which began higher up. Those on Aug. 9 began at stone 6 and those on Aug. 10 at stone 5.8. The reason for going back from 6 to 5.8 illustrates the compromises that must be made for tests of this kind in practice. It was as follows: When starting at stone 6 the stronger fuel mixtures would carry the car far beyond stone 7, and here the road is much less steep than further below, which would make the comparisons of fuel consumption appear more favorable for the stronger mixtures than it really is. To avoid this flat upper stretch, which was reached only by the very strongest fuels, the start of the runs was thus laid back, not to 5.5 but to 5.8. The perfectly ideal test road can of course never be found, and in comparing the figures obtained one will always have to make some allowances for the peculiarities in the conditions.

Table 1 shows the results of the runs made on Aug. 9. They were made on a warm and bright day between 11.30 a. m. and 1.30 p. m., the thermometer registering about 25 deg. C. The runs shown in Table 2 are those made on Aug. 10, when it was still warm but cloudy with occasional

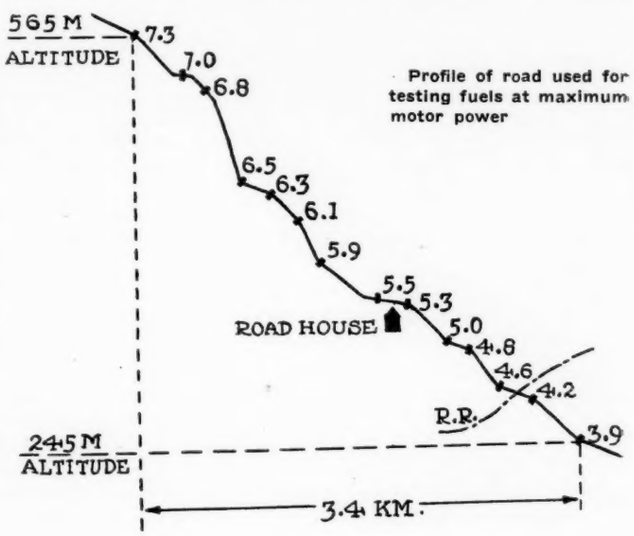


TABLE 1

Fuel, ½ liter	*Km.-stone* From	To	*High Speed* Kw.-hr.		*Low Speed* Kw.-hr.	
1 benzol + 5 alcohol	6.0	7.115	28	III	22	II
1 " + 3 "	6.0	7.27	34	III	24	II
1 " + 1 "	6.0	7.41	40	III	24	III
1 benz. + 1 kero. + 1 alc.	6.0	7.475	42	III	28	III
1 b. + 2 kero. + 1½ alc.	6.0	7.43	43	III	29	III

The Roman figure after the car speeds indicates the gear used when the car speed was recorded.

TABLE 2

Fuel, ½ liter	*Km.-stone* From	To	*High Speed* Kw.-hr.		*Low Speed* Kw.-hr.	
1 benzol + 5 alcohol	5.8	6.83	30	III	24	II
1 " + 4 "	5.8	6.86	30	III	25	II
1 " + 3 "	5.8	6.99	35	III	28	II
1 " + 2 "	5.8	7.15	38	III	5	III
1 " + 1 "	5.8	7.27	40	III	22	III
Pure benzol	5.8	7.26	40	III	24	III
Pure gasoline	5.8	7.15	40	III	24	III
1 benz. + 1 kero. + 1 alc.	5.8	7.12	40	III	17	III

light rain. In Table 2 the equal mixture of benzol and alcohol appears again more favorable than benzol alone, as on many previous occasions. In the column for lowest speeds in Table 2 it is interesting to note that the speeds reached on second gear as a rule are higher than those reached on third gear, and this is explained by the fact that at this steepest place in the road the motor speed became quite low on the third gear, in order to avoid a gear change. With the more alcoholic mixtures the change from third to second speed became necessary long before the steepest spot was reached. With the 1-to-2 mixture it was very questionable whether the third speed would have pulled through, as the speedometer had fallen to 5 kilometers per hour causing me to change and drive the last 20 meters on the second. The ability to drive on the third gear at such a low speed in this place, where the gradient is about 1 to 8, is characteristic of the sustained pull obtained with the alcohol and benzol fuels. With gasoline a similar drop of the car speed would be entirely out of the question; there would be first considerable clicking and knocking of the mechanism and, unless the gear were changed, the car would soon jerk a little and stop. German drivers have now become accustomed to this excellent quality of benzol and alcohol and accept it unthinkingly as a matter of course. But, if we were to return to gasoline, we would often be astonished at the motor's ready tendency to knocking, which has now almost been forgotten. [The author is speaking of the modern European motor with long stroke and a speed of about 3000 r.p.m., and it is only for motors of this type that his data on the efficiency of the fuel mixtures hold good.]

The runs made on August 10 and represented in Table 2 mark the close for the present of my tests of benzol-alcohol mixtures with a carbureter adjusted for gasoline and with the particular car employed. This car has during one year been driven about 3000 kilometers with benzol-alcohol mixtures. No injurious influences were experienced. The mixed fuels were found cheaper, for a given amount of road work, than unmixed ones, at the prevailing prices. As shown in numerous tables, the power efficiency of the mixed fuels was not always inferior, comparing volumes or weights, and where inferiority was shown it was usually slight. With the strongly alcoholic mixtures the difficulty arose on cool days that it was inadvisable to load the motor down suddenly; on approaching a rise in the road gradient the throttle had to be opened gradually in order to keep the motor warm enough. But it may be said at once that this difficulty can be almost overcome, as the motor worked well with unheated mixtures rich in alcohol and with clear alcohol after the area of the air channel around the jet in the carbureter had been contracted. The trials made with the carbureter modified in this manner remain to be accounted for, but they have not yet been quite brought to a close. I have already reached the viewpoint, however, that it is more than a mere trade puff when some makers of motors and of carbureters contend that their productions work just as well with alcohol as with gasoline. On the very first run of my own series of trials with a contracted carbureter I attained almost exactly the same power efficiency as previously with gasoline and a carbureter of normal section. The fuel consumption is also much more moderate than assumed at most automobile factories. It is regrettable that evidently very few know what an excellent fuel alcohol is for motor vehicles. The smaller heat value of alcohol is balanced, so far as power efficiency is concerned, by its smaller need of air for combustion, which permits us to burn a much larger quantity of alcohol in a given time in our automobile motors than we can burn of gasoline or benzol.

The principal trouble with alcohol as an automobile fuel arises through the rapid variations of the motor load. On long trips over level roads the motor becomes so cold that it is hard to make it pull for a hill, but numerous expedients are at disposal (see THE AUTOMOBILE for August 12, page 289) for heating the intake channel and completely overcoming this drawback.

Facts About Rust and Its Formation

WHILE everybody knows considerable about rust, few know enough for practical purposes, and some of the facts which have been observed in connection with the formation of rust under unusual circumstances are still only partly explained by science. To enable owners of automobiles to protect their vehicles against the inroads of rust with a better understanding of the task than that usually possessed outside of the chemical profession, Dr. P. Martell gives in *Auto-Technik* a line of information on this subject which covers the ground in a practical manner and which is reproduced in part in the following.

Chemically, rust is a combination of metallic iron with oxygen and water. In 100 grams of dried iron rust the proportion is about 52.3 grams of iron, 22 grams of oxygen and 25.7 grams of water. The water is chemically combined, not free. It is permissible to conclude from this composition of rust that is can only be formed when iron comes in contact with both oxygen and water. And practice confirms this conclusion, showing that, if either oxygen or water is absent, no rust is formed. Iron remains free from rust, for example, in water which contains no oxygen. Also, steel and iron can be protected almost completely, if there is placed in the room where the metal is kept a quantity of chloride of calcium, which draws all water out of the air in the room.

Oxygen alone, as said, does not attack iron at ordinary temperatures. Fine steel instruments can be easily protected by taking advantage of this fact. To this end a layer of dry chloride of calcium is placed in the bottom of a glass vessel which can be closed by an airtight cover and the instruments are placed upon, or suspended from, an intermediate and perforated wood or cardboard cover plate secured in the vessel, after first dipping the instruments in alcohol to remove traces of water. Ordinary atmospheric air, containing free oxygen and usually a considerable admixture of water vapors, is of course strongly rust-forming, and the same applies to all organic and inorganic acids, even the weakest, to all chlorides of metals and alkalies and to all salts which

are hygroscopic or rich in water. Spring, well and rain water cause rust quickly, but if it is boiled first, so as to drive out the oxygen it contains, iron immersed in it will not begin to rust until the water gets a chance of absorb oxygen from the atmosphere again.

Cold water causes rust more easily than hot, because it contains more oxygen. Rain water is particularly injurious because it has absorbed a great deal of oxygen while passing through the atmosphere. The active agent in rust formation may be said to be a solution of oxygen in water. But carbonic acid also plays a certain part, being constantly produced as the rusting process continues. One of the main questions is now: How and why does rust go on forming after a layer of it has once appeared? In the case of zinc and lead, when it is exposed to air, a thin skin of metallic oxide is formed which remains unchanged and protects the metal under it against all further change. The first layer of iron rust, on the other hand, forms a porous mass which continues to admit oxygen, while it attracts liquids, especially water, by precipitation as well as by capillary action. For this reason the contention that rust produces rust is justified. To be sure, it is not truly the rust which produces more rust, but its porous nature supplies the condition for additional formation. If old or new rust is kept free from water no increase takes place.

A notable phenomenon in iron which is rusting is the marked increase of volume. This is sometimes of special importance, as the expansion takes place with considerable force and has been known, for example, to drive big building stones apart which had been set with iron clamps in mortar. It might similarly, through rust formation between spring leaves, cause the stripping of spring clip nuts in an automobile. Plaster of Paris also has an unfavorable rust-forming effect on iron inclosed therein. Pure cement, on the contrary, furnishes an active protection, even when used as a mere paint.

Science has not yet given sufficient explanation for the fact that the rust formation on an iron surface takes place in unequal degree, though the atmospheric conditions are the same for the whole surface. It is ascribed to the variations in the metallographic structure of the iron, porous spots being most exposed, and this agrees with the observation that the vicinity of fissures is always most strongly attacked, and also with the comparative immunity of the dense alloys of iron formed with nickel and chromium.

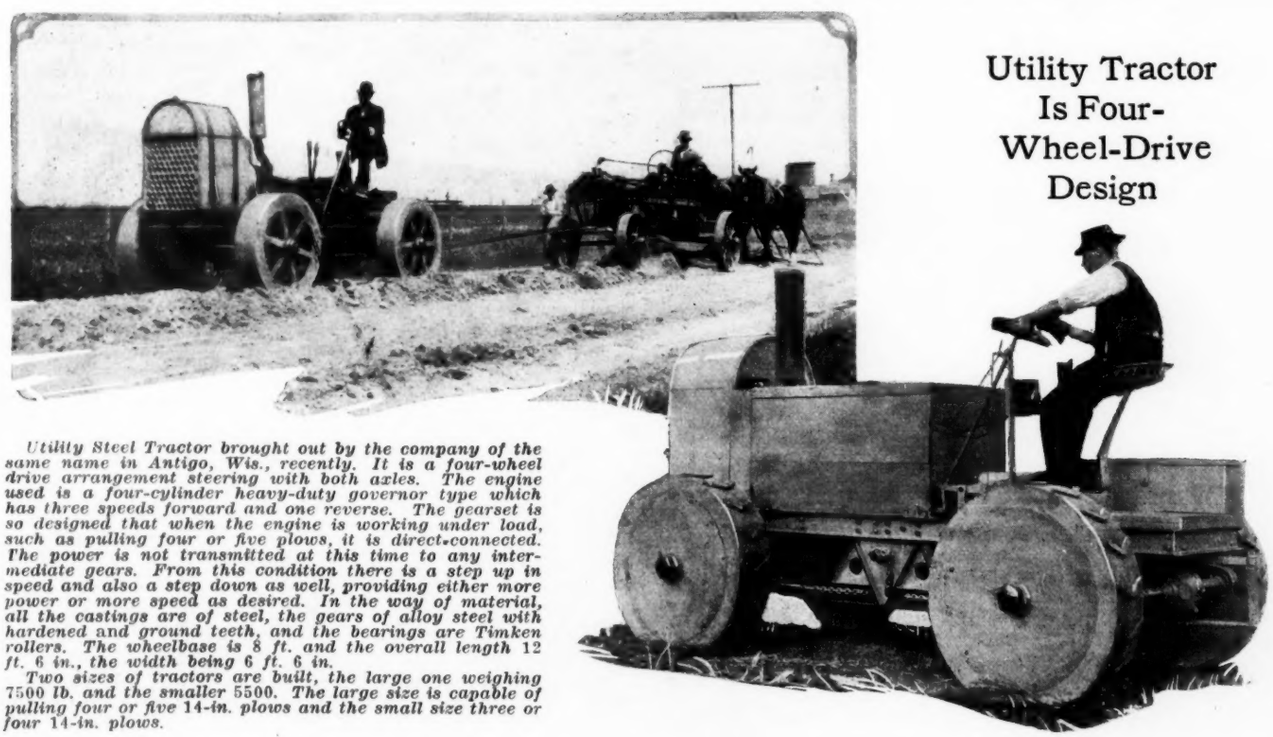
Muriatic acid and common salt generate rust quickly by contact, and if sheet iron shows small almost invisible holes this effect can with certainty be ascribed to acids. Paper, as used for wrapping purposes, usually affords an excellent rust protection.

The coloring of rust varies greatly. Fresh rust is usually a bright yellow, changing with age into brown and almost to black, but the change of color does not always take place. When rust occurs as a fine powder it is mostly yellowish-red, like the iron oxide found in nature. The porous character of rust renders it possible to soften it by making it absorb kerosene, whereafter it can be rubbed off with sandpaper, pumice or emery.

In practice the means for keeping rust away are more important than those for removing it. These means may be intended to be temporary or permanent and are classified accordingly. Reference to the permanent means—enameling, galvanizing and electroplating, chemical browning and blacking, etc.—may here be entirely omitted, but a few facts may be mentioned with regard to temporary protection, these being applicable to a considerable extent when a car is laid up for the winter months or longer. To protect small iron objects for some length of time, a quick-drying solution of rosin, an alcoholic lacquer or a solution of celluloid is much more effective than mere oiling or coating with graphite, which however are sufficient for short periods if the atmosphere is kept dry with chloride of calcium.

Where oil paint can be used it is well worth remembering that its protecting effect is much more lasting if the paint is dried artificially at a temperature of 50 to 60 deg. C. Before any painting is applied all previously existing rust should be removed, as no means has been found for preventing a rust spot from spreading and deepening under a coating. The more varnish a paint contains the more protection against rust does it afford. If a coating of oil is first removed from an iron surface, as it always should be, before a more permanent coating is applied, great care must be taken that this removal is complete, as otherwise the more permanent coating will adhere and cover only very imperfectly.

Utility Tractor Is Four-Wheel-Drive Design



Utility Steel Tractor brought out by the company of the same name in Antigo, Wis., recently. It is a four-wheel drive arrangement steering with both axles. The engine used is a four-cylinder heavy-duty governor type which has three speeds forward and one reverse. The gearset is so designed that when the engine is working under load, such as pulling four or five plows, it is direct-connected. The power is not transmitted at this time to any intermediate gears. From this condition there is a step up in speed and also a step down as well, providing either more power or more speed as desired. In the way of material, all the castings are of steel, the gears of alloy steel with hardened and ground teeth, and the bearings are Timken rollers. The wheelbase is 8 ft. and the overall length 12 ft. 6 in., the width being 6 ft. 6 in.

Two sizes of tractors are built, the large one weighing 7500 lb. and the smaller 5500. The large size is capable of pulling four or five 14-in. plows and the small size three or four 14-in. plows.

The Rostrum

Heat a Factor in Valve Clearance

EDITOR THE AUTOMOBILE:—Please publish proper clearance between valve stem and valve stem guides on a T-head motor and whether or not the clearance on the exhaust and intake sides should be the same.

My car has developed hard starting and constant missing at low speed. Upon investigation we find abnormal clearance between valve stem and valve stem guide on intake side, and expect to ream the guides to fit new valves. Will this overcome our difficulty?

Bridgeport, Conn. S. L. B.

—The amount of clearance between your valve stems and valve guides will depend upon how efficacious the cooling system is. A car which is amply cooled requires less clearance in parts likely to expand than one which is inadequately cooled. A clearance of 0.004 in. will not be too much where the parts are subjected to high temperatures. It might be best to try a clearance of 0.002 in. and gradually enlarge it if necessary by lapping in the valve stems.

New Motor Will Give Higher Speed

Editor THE AUTOMOBILE:—I desire to refinish and repaint my car and am thinking of finishing the wheels in natural wood color, artillery type. Is this simply a varnish over the natural wood after the present paint has been scraped and sandpapered off?

2—I also intend to install a model C 3¾ by 5 Wisconsin engine in place of the four-cylinder 4 by 4 engine I have at present. The car has a racing type body, 32 by 3½ tires, weighs 2400 lb., is geared 56 by 17 on direct drive. What speed should this engine give me? The present one will not give much better than 40 m.p.h.

Suffern, N. Y. H. S. V.

—Yes.

2—It is quite difficult to guarantee a car speed as there are so many things which must be taken into consideration. The Wisconsin Co. states that its 3¾ by 5-in. motor has driven a 2200-lb. car 60 m.p.h. It is necessary to have an easy-running chassis in order to attain this speed. With a fairly good design you should have no trouble getting 50 m.p.h.

Magnalium Is a German Product

Editor THE AUTOMOBILE:—What foundries in the United States make magnalium?

2—What is its formula?

3—What are its physical properties?

4—How does it compare with aluminum in strength, etc.?

5—How does it compare with bronze in strength, etc.?

6—What acids, if any, affect it?

7—Is it difficult to machine?

Chicago, Ill. H. E. L.

—There is no foundry in the United States which makes magnalium. Magnalium is the name of a German metal and was imported into this country before the European war broke out and made into castings by the Walker M. Levett Co., New York City. There is no magnalium in the United States to speak of at the present time, and it is doubtful if same is being manufactured in Germany at this time. The Walker M. Levett Co. undertook to produce a metal similar to magnalium when the supply was cut off in August, 1914, and, securing the proper formula and process of manufacture, succeeded in producing the alloy known as magnalite, and this metal has been used since for piston purposes.

2—The formula is not known to any other than the makers.

3—Their physical properties are:

Magnalite	*Magnalium*
Specific gravity—2.59	The same but showing a tensile strength of 4000 lb. per sq. in. less than magnalite.
Weight—161.5 lb. per cu. ft.	
Thermal conductivity—92.0	
Tensile strength 25,400 lb. per sq. in.	
Coefficient of expansion —0.000025.	
Elastic limit—16,800 lb. per sq. in.	
Compression strength—128,000 lb. per sq. in.	

4—This depends entirely upon what is meant by the word aluminum. If pure aluminum is referred to, the table below will give the desired information.

	Magnalite	Magnalium	Aluminum 99 %	Cast Iron
Tensile strength, lb. per sq. in.	25,400	21,400	14,000	16,500
Compression strength, lb. per sq. in.	128,000	128,000	12,000	*90,000

*Average.

However, pure aluminum is not used for commercial purposes without being alloyed; it is therefore necessary to state the alloy before this question may be answered intelligently.

5—There exist many kinds of bronze. The word "bronze" itself means little unless the kind is stated. Certain bronzes show as high a tensile strength as 80,000 lb. per sq. in. and others less than No. 12 aluminum alloy. It is consequently impossible to answer this question with the incomplete data on hand.

6—Concentrated sulphuric acid acts only very slowly on the metal, although the sulphuric acid of commerce usually contains an amount of hydrochloric acid sufficient to rapidly act on the metal.

Nitric acid, either concentrated or dilute, has very little action on magnalite when cold; when heated it acts very slowly.

Sulphur has no action at a temperature less than a red heat.

Magnalite is found to withstand the action of organic secretions better than silver, and is receiving large use for dental plates and surgical instruments, and in places where subjected to carbolic acid or other antiseptic solutions. Magnalite is little acted upon by salt water. Solutions of salt and vinegar, such as it is apt to be subjected to in ordinary culinary operations, do not injure the metal. Magnalite is little acted upon by mineral waters, and withstands the action of sea water better than iron, steel or copper.

Magnalite is not acted upon by carbonic acid, carbonic oxide, or sulphretted hydrogen; but on being melted, will

absorb these gases, quite a portion of which is again excluded on the metal cooling.

7—It is not difficult to machine. It differs in this respect very considerably from aluminum, inasmuch as the chips are emitted very readily without the tendency to bind between the tool and the work. It may be run at very high speed in turning, and an extremely high finish may be obtained on same without grinding. This latter operation is dispensed with entirely in piston finishing.

Cannot Use Battery on Magneto Side

Editor THE AUTOMOBILE:—I have a 1910 Cadillac, which has two separate ignition systems, one for batteries and one for magneto with two sets of plugs. I have taken off the battery system and have been using the magneto system through the summer, and had no trouble in starting, but since the fall has set in, I have considerable trouble in getting the car started on the magneto.

I would like to know if I can arrange the magneto so that I can send the battery current through the distributer and use the one set of plugs.

Martinsburg, W. Va. R. N. S.

—It would be impossible to obtain proper ignition by connecting a battery on the magneto side of the 1910 ignition system. Try closing the spark plug points a little.

Putting Ammeter on 1915 Hupmobile

Editor THE AUTOMOBILE:—Kindly furnish me with the necessary instructions to install a charging and discharging ammeter on the 1915 Hupmobile.

Maysville, Ky. K. B.

—The accompanying illustration, Fig. 1, gives you the connections of the battery, motor, generator, etc., and indicates where the ammeter is to be connected.

Turbines Too Large for Steam Cars

Editor THE AUTOMOBILE:—Explain the operation of the Diesel and Oil-Pull oil engines. By whom and where are they made? If foreign made, who is the agent in this country? I understand that these engines use a crude oil for fuel and that it is fed into the cylinders under about 500 lb. of pressure. Is this correct? If so, explain fully. Why does it carbonize in the cylinders? What ignition and oiling system do they use? What kind of valves? When will their patents become invalid?

2—Could a steam turbine be used in the Stanley steam car to furnish the motive power? If not, why?

3—How many cylinders has the Gnome rotary type motor? How is it attached to the crankcase? How cast, in pairs, fours or single? How many revolutions per minute will it make? How is the gas fed to the cylinders? What oiling system does it use? What kind of valves does it use? What is the greatest fault of this motor?

4—What is the hydraulic brake like?

5—Were the timing gears on the 1913 Lozier light six made of cloth? If so, explain the process by which they were made? Could transmission gears be made this way? If not, why?

6—What is meant by candlepower and volts in electric lamps?

7—Who makes the following parts for the Woods Mobilette, and what is its piston displacement?—Motor, axle, frame, body and steering gear?

8—Will you allow a reader space in each issue or answer a contribution otherwise?

Cooper, N. C. S. T.

—In a Diesel engine the piston on the first down stroke draws in pure air. This is compressed to a very high pressure on the up stroke and as it descends again, oil is blown in through a nozzle in the cylinder head by means of air under a pressure of 1000 lb. per square in. or more. High compression of the air in the cylinder makes it hot enough to ignite the oil which is blown in. The last stroke is a plain exhaust stroke as in a gasoline motor. The Diesel engines are made by many firms in many parts of the world. It would be impossible to publish a list of them here. The valves used are usually poppet valves. The basic patents have long since expired, but the success of the Diesel engine depends mainly upon patented details.

2—No, because it has not so far been possible to make a steam turbine in small sizes.

3—Either seven or fourteen. The cylinders are not cast, but are cut from solid blocks of steel. It makes about 800 to 1100 revolutions. Gasoline is fed through the crankcase and then through valves in the piston heads. Oil is fed with the gasoline. Concerning the motor's greatest fault, would refer you to article by W. F. Bradley in THE AUTOMOBILE for Oct. 21.

4—Brakes which are operated by a fluid medium.

5—Compressed cloth gears have been used for crankshaft drives for many cars. They are made by various processes in which very heavy hydraulic pressure is used to compress the material. The gears cannot be used for transmissions, because they would not stand the jar of engagement consequent upon frequent shifting.

6—Candlepower is the way of measuring the amount of light given by the naked electric bulb without a lens or mirror. Candlepower is a scientific unit of measurement of light. The voltage shows the nature of the current to which the lamp is suited.

7—The parts you mention are not stock parts and are made specially for the car. The piston displacement of the Woods Mobilette is 86.4 cu. in.

8—Whether we publish a letter or not depends upon our estimate of its interest to readers generally. We are always willing to answer any number of letters from readers through the mails.

Wants Hp. Rating of Two Sixes

Editor THE AUTOMOBILE:—Will you please send me the formula rating of horsepower on the Velie light six automobile engine of 1916?

2—Also the rating of the Buick light six of 1916.

Sugar Grove, Ill. J. S.

—The formula rating of both cars is 25.35 hp.

Oldfield's Christie Holds No Records

Editor THE AUTOMOBILE:—Kindly give me the records held by Barney Oldfield's Christie car.

Philadelphia, Pa. B. U. G.

—At the present time Barney Oldfield does not hold any A. A. A. record with a Christie car.

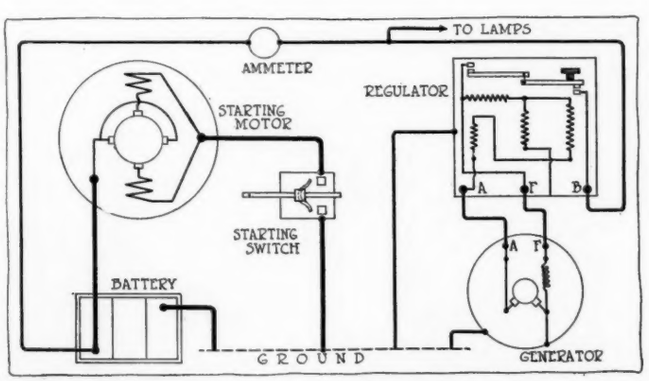
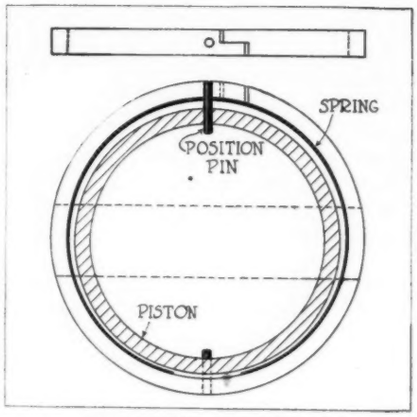


Fig. 5—Wiring diagram for installing ammeter on 1915 Hupmobile

ACCESSORIES

Peerless Simplex Piston Ring

AS shown in the accompanying illustration, this is a lap joint ring within which is a special heat-proof steel spring for preventing leaks at the lap joint. Two or more of these rings per piston should be used, there being a pin in the piston to hold each ring and spring in position, the pin shown in dotted lines in the illustration being that of the adjacent ring, which in each case is diametrically opposite. The rings should be lapped in on worn cylinders if not bearing properly in the same position as pinned on the piston. To place the steel springs in position the rings are placed partly over the grooves and the springs are inserted beneath the rings which are then forced over them and into the grooves. These rings are designed to save oil and to prevent loss of power due to leaky and inefficient piston rings. Prices run from 45 cents each for the 2½ to 3½-in. diameter sizes, the width being 3/16 to ¼ in., to 65 cents each for the 5⅝ to 6-in. diameter with widths of ¼ to 5/16 in.—Peerless Piston Ring Co., Newark, N. J.



Peerless Simplex piston ring

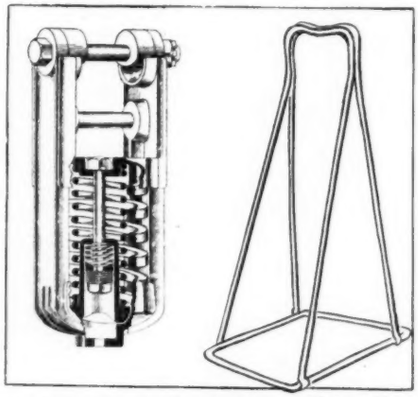
McKinnon Tire Storage Stand

This stand is designed to hold tires off the ground and is made in two sizes, one for Fords and other small cars and the other for larger cars. The small sizes are 15¼ in. high and the other 17 in., the bases being 7 by 8 in. in each case. A set of four of the small sizes weighs 10¼ lb.; and of the large size 11 lb. The stands are made of electrically-welded steel.—McKinnon Dash Co., Buffalo, N. Y.

Pamco Shock Absorber

The Pamco shock absorber is a device intended to replace the ordinary spring shackle and at the same time afford an absorbing device which will compensate for the action of rough roads. The entire device, which is illustrated in section, consists of a triple spring arrangement mounted in a malleable steel yoke forging. The main member is a vanadium steel shock absorbing spring which takes direct loads and acts as a medium between the axle and the regular leaf spring. The shock absorbing spring is a coil and has within it another coil spring which is a self-adjusting load spring and which automatically takes on the proper degree of compression by conforming itself to the weight placed upon it by the car. Through the center of these springs is an equalizing bolt upon which the spring rebound housing travels and at the end of this bolt is a vanadium steel rebound absorbing spring.

The self-adjusting load spring is connected with one shackle bolt while the other shackle bolt connects with the other end of the absorbing device, giving a floating medium which is the shock absorber, between the two shackle bolts. The device sells for $15.—Auto Devices Co., St. Louis, Mo.

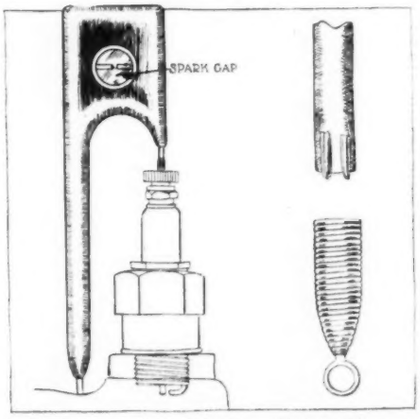

Left—Pamco shock absorber. Right—McKinnon storage stand

Royal Plug Tester

Instead of using a screwdriver or other tool to test a spark plug by grounding it to the cylinder, the Royal tester is used. It is made of an insulating composition and a brass wire runs through it, one end being exposed for application to the plug and the other end exposed for application to the cylinder. A spark gap is placed in the body of the tester with a mica window on each side; this takes the place of the gap made between the end of the screwdriver and the cylinder and is safer because it does not strain the insulation of the coil or magneto by forcing the spark to jump too wide a gap. The tester sells for $1.—Royal Tester Co., Pittsburgh, Pa.

Climax Spring Terminal

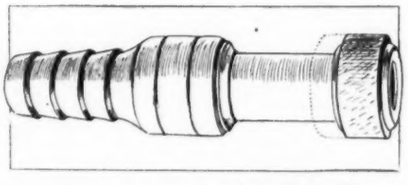
In the Climax terminal, spring steel wire is coiled into the form of a tapered tube with a loop for the spark-plug terminal at the small end and the other end is left open. The insulation of the cable is stripped off for about ⅝ in. and the stranded wires separated and folded back on the cable, which is then inserted in the open end of the terminal with a twisting motion. This provides contact but does not place any strain on the wire of the cable. The makers state that it is impossible for the terminal to work off. Various sizes are made for cable of all outside diameters. A special brass terminal is made for primary batteries.—Climax Motor Devices, Cleveland, Ohio.

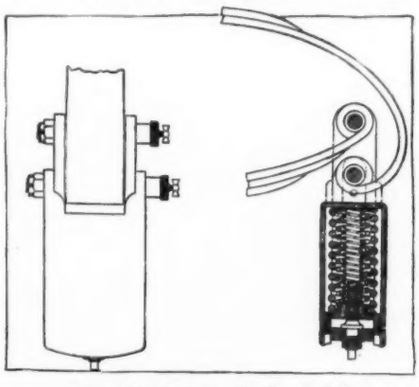


Left—Royal plug tester. Right—Climax spring terminal for cables

Cox Shock Absorber

This shock absorber is still made with three coiled springs nested and adjustable from the bottom by means of a threaded rod with a locking nut to hold it in position. The head and cylinder are now


Binks' Automatic shut-off nozzle


New Model Cox shock absorber

made in one piece to avoid the possibility of weakening at joints. All the bearings have machine fits and the sliding rods are fitted with fiber bushings to make them quiet. The slide bearings have been increased in length to 5½ in. The piston or plunger is 2 by ¾ in. Fittings are made for spring widths of 1¾, 2, 2¼ and 2½ in., and shackle bolts, which are drilled and fitted with grease cups, are made in various sizes. Five different spring weights are made, so that the combination best suited to any particular car can be used; charts are supplied to dealers showing plainly what combinations of springs to use under given conditions. Price, $10 per set.—Cox Brass Mfg. Co., Albany, N. Y

Binks Water Valve

The Binks valve for car washing has an automatic shutoff which stops the flow of water the moment the operator releases his hold on the nozzle, a pressure of the thumb being sufficient to keep the valve open. The nozzle is nickel-plated brass with a rubber bumper to prevent damaging the paint. It is made for ¾-in. hose and sells for $1.—Star Brass Works, Chicago, Ill.

New-Type Lamps for Fords

This is a set of lamps designed to take the places of the standard Ford side and tail lamps; they can be attached by bending the original brackets. The set includes, in addition to the lamps, all wiring, connectors, body bushings and switch on each lamp. Lenses are of the semaphore type. Bulbs are supplied in voltage as ordered. The set comes neatly boxed, ready for installation, and sells for $5.—Wood Mfg. Co., Fairfield, Conn.

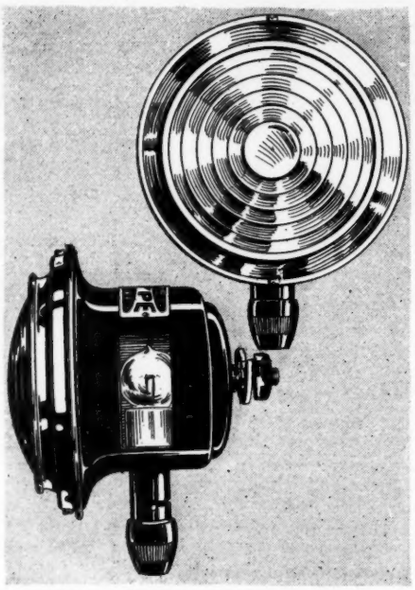
Affa Spindle Adjuster

The Affa spindle adjuster for Ford cars consists of a strong flat steel spring fitting inside the steering rod yoke and pressing against the spindle arm, the pressure automatically taking up wear and preventing rattle from looseness. The adjusters sell for 50 cents per pair.—W. S. Graffam, Northampton, Mass.

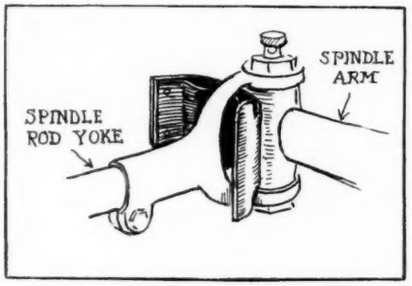
Burners for Gas Lamps

Users of acetylene lighting will be interested in the Brilliant type of burner which is claimed to increase the intensity of the light three times without increasing the cost of operation. That is, while the common acetylene burner gives 20 candle power, according to the makers, the Brilliant burner will give 60 without using any more gas. The burner is interchangeable with the ordinary burner, and its principle depends upon the use of the small incandescent button ⅞ in. diameter. An acetylene jet is projected against this button and the upper part of the burner is turned so that the face of the button is toward the reflector, as shown in the illustration.

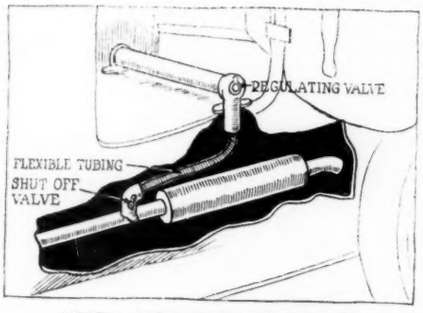
This is the position of the button for ordinary driving. To produce a diffused or spreading light it is only necessary to turn the white face of the button away from the reflector, which will immediately cut out the reflector and dim the light. The price is $3 per set, consisting of two burners complete and one extra button. Extra buttons sell for 70 cents per pair.—Monosmith Bros., Spencer, Ohio.



Newtype electric lamp for Ford cars



Affa steering spindle adjuster



Utility exhaust-operated heater

Utility Exhaust Heater

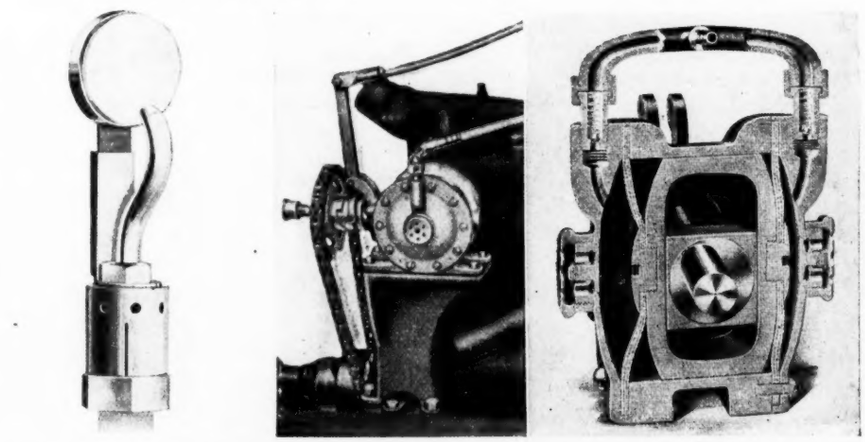
This heater consists of a tubular footrest through which part of the exhaust is allowed to pass, after which it escapes into the air. A small pipe is tapped into the exhaust pipe ahead of the muffler and is led to one end of the heater-footrest; a regulating valve is inserted at the junction. The waste pipe at the other end of the heater completes the equipment. The boring of two small holes in the floorboard with the drilling and tapping of the exhaust pipe and the screwing of the heater to the floor are the only operations required for installation. It lists at $15.—Hill Pump Valve Co., Chicago, Ill.

Champion Duplex Tire Pump

It is claimed that the Champion duplex diaphragm pump will fill a 3-in. tire up to 60 lb. in less than 40 sec., it being possible to run it at 800 r.p.m. for an hour without trouble. As shown in the illustrations, there is an eccentric driver and two diaphragms so that there are two pumping operations at every revolution. One of the points of design is that the pump is so constructed that it is impossible to pump oil into the tire, an exceedingly valuable feature inasmuch as oil is very injurious to the rubber of the inner tube. The principle of operation is shown in the sectional illustration. These pumps sell for $20 each.—Champion Auto Equipment Co., Chicago, Ill.

Phillips Elliptic Springs for Fords

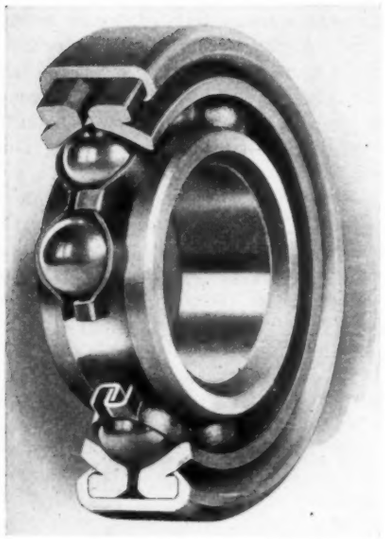
Four elliptic springs and all parts for attaching to a Ford car in 2 hr., sell for $30.—Phillips Bros. Mfg. Co., Jackson, Mich.

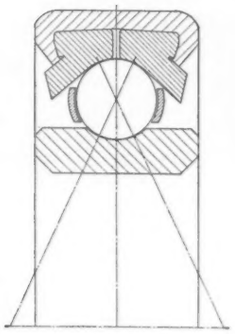


Left—Monosmith Brilliant burner for acetylene lamps. Center—Champion duplex diaphragm tire pump, showing mounting. Right—In section

Schatz Annular Bearing Takes Thrust

Sustains 50 Per Cent of Rated Radial Load in Either Direction Without Adjustment





Above — Diagram showing ball support in Schatz annular bearing

Left — Cutaway section of Schatz bearing, showing assembly

AN annular ball bearing capable of sustaining a thrust load of 50 per cent of the rated radial load in either direction and without adjustment, has been brought out by the Schatz Mfg. Co. of Poughkeepsie, N. Y. The bearing which is known as the Schatz Universal annular ball bearing gains its ability to withstand end thrusts due to the arrangement of the outer race which provides two points of contact instead of one as in the conventional type of bearing. Thus the balls have three points of contact, two points in the outer race rings and the third located in the inner race ring.

The Two-Point Contact

Referring to the assembly view, it will be noted that the outer race is in two parts each of which have a curved recess generated on their inner periphery forming a raceway for the balls. It is here that the two-point contact is secured. A curved ball track is generated on the outside of the cone or inner race ring and is designed to allow precise co-axial rotation. The curvatures of the raceways in the outer race rings and in the cone are 4 per cent greater than that of the ball therefore giving, theoretically, point contact, although under load providing a contact area large enough to support a high thrust load.

The two-point contact of the outer race is so arranged that the points are located at a given angle on either side of the center line of the bearing while the center line passes through the third point of contact at the inner race. Diagrammatically the three-point contact gives a triangular support which gives a resultant action that permits the high end thrusts to be endured.

Large Thrust Overload Permissible

While the bearing cannot be called a thrust design, the large thrust overload permissible in many cases would obviate the necessity for an additional thrust bearing and would consequently lessen the cost of the installation as a general rule in such instances. It is also claimed for the bearing that the three-point contact increases the load capacity since with this arrangement the shock is not transmitted through the centerline of the ball. Broken balls are practically always due to a shock through the center and with the three-point contact, the area affected is so much greater that the unit stresses are smaller.

The actual construction of the bearing is shown in the accompanying illustrations and the triangular layout of the support is also shown. The cup rings are a press fit in the outer case and after assembling the case is closed over the cups thus permanently fixing the inter-relationship between the various parts of the bearing.

Maximum Number of Balls Used

The ball separator, which is also shown, is of pressed steel and is a self-locking design without rivets. The principle upon which the separator is constructed allows the maximum number of balls to be used and also supports them upon their axis of rotation or at the points of least friction and wear.

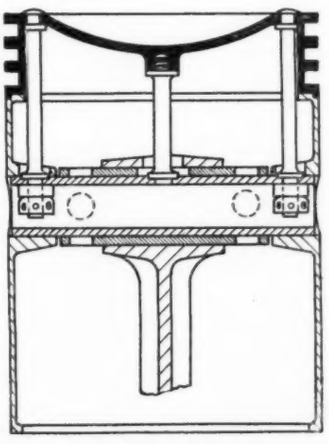
The accuracy of the balls is checked to 0.0001 in. and the surface finish is also carefully checked to insure smooth and quiet running.

All Parts Heat-Treated

High quality materials are used throughout in manufacture; all parts being high carbon chrome alloy steel except the case and ball separator. All the steels are made to a definite analysis and must conform to the required physical standards. As a check on the materials, each heat is analyzed to determine the chemical constituents of the steel. All the parts are heat treated in the furnaces of the Schatz company, which are carefully checked by delicate electrical pyrometers.

The dimensions of the bearings, as regards diameter, width and bore are in accordance with the international standards covering these points which renders the bearing interchangeable with those of other makes. S. A. E. standards are used throughout.

New Steel Piston Design



C. Y. Knight's steel piston

THE accompanying cut shows a built-up steel piston recently the subject of a patent granted to C. Y. Knight. The idea is, of course, to combine lightness and strength for purposes where cost of production is a secondary matter. The method for supporting the wristpin directly from the head permits the pin to have a very long bearing in the connecting-rod, and the piston should be a far better manufacturing proposition than a steel piston cut from the bar in one piece.

The Automobile

PUBLISHED WEEKLY
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Vol. XXXIII Thursday, December 9, 1915 No. 24

THE CLASS JOURNAL COMPANY

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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

More Class Legislation

THE proposal in the President's message to Congress to tax automobiles 50 cents per horsepower and also to impose a tax of 1 cent per gallon on gasoline can only be looked upon as a double taxation on progress. It is class taxation of a highly discriminatory character and a movement that will meet with country-wide opposition, not because the people do not want to carry their just share of the burden of taxation for national defense or other legitimate measures, but, because the present plan is diametrically opposed to the spirit of equality defined in the constitution.

In meeting emergencies, such as Congress is today confronted with, the equitable plan is to tax all forms of business on a uniform basis, rather than the highly unfair method of selecting certain businesses that may be more in the public eye than others and placing the burden on them. The American citizen is fully cognizant of the necessities of taxation, he or she does not desire to shirk responsibilities to the nation, but asks for a just division of them.

Automobilists are in accord with any effective, just program, and hundreds of thousands of them stand ready to place their cars at government disposal for national defense if emergencies arise, but these hundreds of thousands shou!d determinedly combat this latest form of class taxation.

Progress in Ignition

DURING no period of the history of the automobile industry has the demand for the most efficient ignition been so great as at present. The requirements are more severe upon this part of the motor functioning than ever before and it is but natural that developments have been made in the ignition field and are even now in progress.

Higher speeds and more cylinders are translated to the ignition manufacturer in terms of more sparks per minute. This means faster breaker mechanisms, faster coils and the elimination of inefficiencies due to lag in the current and due to losses of time in the mechanical actuating mechanism. The methods by which the difficulties have been overcome show that, highly ingenious as the ignition system of to-day is, its limit and capacity have not even nearly been reached.

Perhaps the most significant feature of the ignition development is that in no case has it been necessary to abandon the elementary principle upon which a system operates. Where makers have made improvements it has been merely in the way of lightening breaker parts to overcome inertia, increasing the speed of the coil by improved manufacture and simplifying and rendering more efficient the switches controlling the circuit and the mounting of the unit on the motor.

Ignition for eights and twelves running at high rotative speeds has not puzzled to any alarming extent ignition manufacturers, and where twelve-cylinder motors have been brought out, makers have not been put to any difficulty in securing suitable ignition for them. Improvements, however, are under way even now in the multi-cylinder field and there is no doubt that important ignition progress will be noted within the next few months.

Lubrication in Extenso

THE European car described on page 1 is not being manufactured yet, as manufacturing is understood even in Europe, but even though it is no factor on the markets of the world, even though it may never be manufactured in its present form exactly, it marks a milestone in automobile development. It is reputed to perform well, but did it lack power; did the main frame design prove wrong, the axles weak, the motor inefficient, it would make no difference. A car which needs no attention whatever more often than twice a year is so important an advance in idea upon the conventional principles of automobile engineering that it cannot ever again be forgotten.

This car demonstrates that complete automatic lubrication for every part, however small, is a practical possibility, and that its cost would not be prohibitive. The application to a more conventional type of chassis is a mere matter of detail work, it is the main principle that is so impressive. In a year of enormous development in America and of equally great stagnation in Europe, the latter hemisphere has to its credit at least this achievement.

S. A. E. Winter Session Program

Standards Committee Meets Jan. 4 and Whole Body on Jan. 5 and 6

NEW YORK CITY, Dec. 7—The program for the winter activities of the Society of Automobile Engineers which will extend over Wednesday and Thursday, Jan. 5 and 6 as regards the meeting of the whole body, and Jan. 4 for the Standards committee has been tentatively announced. The meeting will be held at the Engineering Societies Bldg., at 29 West Thirty-ninth Street, and the dinner on Thursday, Jan. 6, at Hotel Plaza at 8 p. m.

Details of the tentative program are given in the November Bulletin of the society as follows:

Wednesday, Jan. 5, 9.30 a. m., Engineering Societies Building, Business Session, Treasurer's Report, Reports of Tellers of Election of Officers, Report of Membership Committee and New Business.

Standards Committee Reports:—Report of Electrical Equipment Division, A. L. Riker, vice-president and chief engineer of the Locomobile Co. of America; Report of Engine and Transmission Division, Prof. W. T. Fishleigh, Engineering School, University of Michigan; Report of Electric Vehicle Division, A. J. Slade, consulting engineer; Report of Iron and Steel Division, K. W. Zimmerschied, metallurgist, General Motors Co.; C. H. Loutrel, Report of Lock Washer Division, C. H. Loutrel, assistant factory manager, National Lock Washer Co.; Report of Miscellaneous Division, John G. Utz, consulting engineer, Perfection Spring Co.; Report of Research Division, David L. Gallup, professor, gas engineering and consulting engineer, Worcester Polytechnic Institute; Report of Springs Division, C. W. McKinley, chief engineer, Willys-Overland Co.; Report of Truck Standards Division, W. P. Kennedy, consulting engineer.

Professional Sessions

Thursday, Jan. 6, 9.30 a. m., Auditorium of the Engineering Societies Building, Professional Session; President's Address, Wm. H. Van Dervoort, president and general manager, Moline Automobile Co.; Address of President-Elect; Effect of Sulphur Content in Steel, Dr. J. S. Unger; Electric Bulbs for Automobiles, Henry Schroeder.

Thursday, Jan. 6, 2 p. m., Professional Session, Battery versus Magneto Ignition; Alexander Churchward, vice-president, Gray & Davis Co., Frank Conrad, electrical engineer, Westinghouse Electric & Mfg. Co., Dr. R. H. Cunningham, chief electrical ignition engineer, Splitdorf Electrical Co., E. Gassman, technical director and secretary. Eisemann Magneto Co. and Electric Lighting and Starting, Joseph Bijur, president, Bijur Motor Lighting Co.

Mid-West Section S. A. E. Elects Officers

CHICAGO, ILL., Dec. 2—Formal organization of the new Mid-West section of the Society of Automobile Engineers with headquarters at Chicago was completed at a meeting of members of the Society from Illinois, Indiana, Wisconsin, Minnesota, Iowa, and northern Indiana at the Chicago Automobile Club last night. This is the outgrowth of a movement among members of the S. A. E. in this territory which took shape Oct. 14 at the time of the meeting of the Standards Committee of the general society in the organization of a temporary section and election of temporary officers, with W. H. Vandervoort of the Moline company, President of the Society, as chairman.

Permanent officers were elected last night as follows: Chairman, F. S. Place, vice-president, the Buda company; vice-chairman, J. W. DeCou, factory manager, Thos. B. Jeffery Co.; treasurer, Charles W. Steiger, president Stromberg Motor Devices Co.; secretary, Darwin S. Hatch, Editor *Motor Age;* assistant to secretary, H. W. Connell, Central Continuation School, Milwaukee. The governing board consists of the above officers with addition of Daniel Rosch, assistant professor of Experimental Engineering, Armour Institute of Technology.

Headquarters have been established at the Chicago Automobile Club. There are between fifty and sixty members of the Society in Chicago and 200 in the territory embraced by the new section.

Three New Jones Models

WICHITA, KAN., Dec. 3—The Jones Motor Car Co., this city, is bringing out three new models, two of which will appear on a six-cylinder chassis with 122-in. wheelbase as a seven-passenger touring car and a roadster, the third model being a five-passenger touring car on a 110-in. wheelbase chassis and using a small six motor.

W. A. King is production manager and chief engineer of the company and N. A. Wise has been appointed chief engineer and assistant production manager.

Detroit S. A. E. Fund Is $2,900

DETROIT, MICH., Nov. 30—The Eclipse Machine Co., has been added to the list of contributors to the maintenance fund of the Detroit Section of the Society of Automobile Engineers. The total contributed to Nov. 15 is $2,900.

231,713 Registered in New York

Divided into 171,698 Cars and 22,949 Trucks—2194 Dealers

ALBANY, N. Y., Dec. 8—Over 36 per cent increase in the number of automobiles registered in New York State since Feb. 1, is revealed in the statement issued to-day by Secretary of State Hugo. The latest figures show that up to Dec. 4 there were 231,713 owners registered and 79,899 chauffeurs. The majority of cars registered, according to the records, are under 25 hp., the exact number being 112,373, while of the remainder, 70,426 are under 35 hp.; 21,790 under 50 hp. and 1224 of 50 hp. or more, or seventy-four less than the total in 1914. In comparison with the State Census figures, taken in June, the count shows that there are about forty inhabitants to each car registered, or 122 persons for each chauffeur licensed.

22,949 Trucks

The total of 231,713 cars registered so far includes 171,698 passenger cars; 22,949 trucks, while there are 2194 dealers registered, each having from one to twenty-five cars in stock, although these machines prior to their sale are not usually registered separately. There were 6807 duplicate sets of plates issued to these dealers. The figures for the same period last year were 169,280, 150,501, 17,037 and 1742, respectively. Of the chauffeurs licensed so far, 58,179 were renewed from last year, when the total number licensed was 65,773, while 21,720 are new.

Standard in Small Truck Field

DETROIT, MICH., Dec. 3—The Standard Motor Truck Co., this city, has added a 2-ton worm-drive truck, selling at $2,000, to its present list of 3- and 5-ton models.

The company will later add a 1- and 1½-ton model. In order to take care of the manufacture of its new models, the company will make additions to its plant.

Bieling Joins Nordyke & Marmon

INDIANAPOLIS, IND., Dec. 7—W. M. Bieling has resigned as sales manager of the Premier Motor Mfg. Co., this city, and joined the sales organization of the Nordyke & Marmon Co.

De Palma Joins Packard

DETROIT, MICH., Dec. 4—Ralph De Palma has joined the Packard Motor Car Co., this city, as a member of the engineering testing department.

Goodyear Earns 5½% on Common

Sales $36,490,652—Net Income $5,137,082—Assets $14,500,000

AKRON, OHIO, Dec. 7—The earnings of the Goodyear Tire & Rubber Co. for the year ended Oct. 31, after all charges were deducted, were approximately 5½ per cent on the common stock. The company's sales were $36,490,652, against $31,056,128 in the previous twelve months. Its net income was $5,137,082. Its current assets are $14,500,000 and its current liabilities $1,944,000.

The balance sheet as of Oct. 31 follows:

ASSETS	1915	1914
Real estate and bldgs...	$3,883,946	$3,606,537
Machinery and fixtures.	3,962,260	3,208,107
Patents, trade m'ks, etc.	1	1
Securities owned	809,326	777,649
Pfd. stock purchased...	258,459	343,593
Notes receivable of officers, employees, capital stock	1,045,816	805,283
Inventory	7,763,189	4,567,460
Accts. and notes receiv.	4,759,246	3,328,693
Advances to agents, etc.	278,070	280,655
Cash on deposit	1,766,352	2,862,706
Advances to Goodyear Imp. Co. and Goodyear Heights Realty Co....	1,047,661	885,315
Suspended assets	334,067	440,438
Prepaid rentals, etc.....	371,529	352,893
Total	$26,279,927	$21,459,335
LIABILITIES		
Preferred stock	$6,650,000	$7,000,000
Common stock	8,377,200	7,991,110
Purchase accts. payable.	1,565,705	410,575
Sundry accts. payable...	378,894	257,509
Res. for doubtful accts..	558,956	564,327
Depreciation of plant...	1,717,230	1,183,418
Surplus	7,031,940	4,052,395
Total	$26,279,927	$21,459,335

Mercer Uses Aluminum Pistons

TRENTON. N. J., Dec. 6—The announcement of the line of cars made by the Mercer Automobile Co., of this city, shows that only minor refinements have been made for 1916, especially as regards the chassis lengths and in the body work.

The new series is known as the 22-72 model and in general design the new models adhere closely to the previous 22-70. Four different body styles are offered, a six-passenger, four-passenger, runabout and raceabout. The six-passenger touring is adapted to family use while the four is a sporting model. Both of these cars have 132-in. wheelbase. The runabout and raceabout are built on a chassis of 115-in. wheelbase. The raceabout is a special speed car with a guaranteed speed of 1 mile in 48 sec., or 75 m.p.h.

While in general the bodies have the same distinctive appearance as those of a year ago, the interior has been improved; for instance, the auxiliary seat compartment of the six-passenger is finished in black walnut paneling. Doors that roll out of sight like the cover of a roll-top desk hide the extra seats. A complete set of tools is carried in a special compartment built into the right front door.

Under the center cowl of the sporting model are three separate compartments for carrying Thermos bottles and miscellaneous items. The middle compartment is sufficiently large to carry a suit case.

Power plant is the same four-cylinder L-head design, 3¾ by 6¾ in. giving an S. A. E. rating of 22 hp. although the makers claim 72 on the block. The piston displacement is 298.2 cu. in. Very light reciprocating parts are used, the connecting-rod weighing with four bolts, 3 lb. 5 oz. These are drop forgings from special high tensile steel. The pistons are aluminum and the only attachment to the exterior of the motor is the Zenith carbureter, the manifold being cast integrally with the cylinders.

The prices are $3,000 for the touring and sporting models, $2,900 for the runabout and $2,750 for the raceabout.

Franklin to Increase Common to $2,000,000

SYRACUSE, N. Y., Dec. 4—Stockholders of the H. H. Franklin Mfg. Co. on Dec. 8, vote to increase the common stock from $900,000 to $2,000,000. The preferred stock, amounting to $600,000, is all in the treasury of the company.

Sparks-Withington Buys Cleveland Radiator Co.

JACKSON, MICH., Dec. 4—The Sparks-Withington Co., this city, manufacturer of automobile signals, radiator fans, etc., has completed arrangements for the purchase of the factory, equipment, and commercial good will of the Cleveland Radiator Co., Cleveland, Ohio, which has manufactured honeycomb radiators for the trade. The complete equipment of the Cleveland factory will be moved to this city and installed in the old Sparks-Withington plant where the manufacture of honeycomb radiators will be started. Quantity production will be under way by Feb. 1. The Sparks-Withington company will soon break ground for a large addition to its plant.

Elliott of United Truck to Sail

GRAND RAPIDS, MICH., Dec. 7—E. M. Elliott of the United Motor Truck Co., will sail Dec. 11 for Europe to observe United trucks in action in England and on the Continent.

G. P. Sweet has been made general manager to succeed Elliott. Mr. Sweet returns from Detroit, where he has been engaged for several years in the manufacturing business.

Another appointment is that of George H. Duck as general sales, advertising and factory manager of the United Truck Co. Mr. Duck has been with the company since September.

Pouvailsmith Corp. Formed

Buys Essex Rubber Condensite Dept.—Warm Hand Steering Wheel Corp. Absorbed

POUGHKEEPSIE, N. Y., Dec. 4—The Pouvailsmith Corp., capitalized at $2,500,000, has been organized here and has purchased the condensite department of the Essex Rubber Co., Trenton, N. J. Condensite is a chemical product of formaldehyde and carbolic acid and makes one of the best non-conductors known, also having a highly polished surface. It is used extensively in the manufacture of steering wheels, accessories and many other products. In connection with the taking over of the condensite department of the Essex company the Pouvailsmith Corp. will absorb the Warm Hand Steering Wheel Corp. of this city.

Of the $2,500,000 capital of the new corporation $500,000 is preferred and $2,000,000 common. There is no stock for sale. The officers of the company are Grant E. Smith, Elias C. Vail, vice-president, J. Wilson Poucher, treasurer and Henry S. Morgan, secretary. Mr. Morgan has been factory manager for the Essex Rubber Co. since the beginning of its condensite business and will be director and factory manager of the Pouvailsmith corporation.

For factory purposes the Pouvailsmith Corp. has purchased 5 acres of land fronting on Smith Street and extending east along the Central New England railroad tracks, where three buildings, having a total length of 340 ft. and a width of 60 ft., will be erected immediately. The railroad will provide a spur for the factory. The new plant will begin operations with about 100 employees. Until this is ready the Pouvailsmith Corp. will operate the condensite department of the Essex company in Trenton, of which it is now in possession.

Puritan Buys Cartercar Parts

DETROIT, MICH., Dec. 8—The Puritan Machine Co., this city, has bought outright the Cartercar parts business. The contract with the General Motors Co. as executed by the Puritan company, provides that service for the Cartercar is secured complete in every detail as long as the life of the car.

Webber Joins Haynes-Ionia Co.

IONIA, MICH., Dec. 4—H. B. Webber, president of the National Bank of Ionia, and several manufacturing concerns, has accepted the position of general manager of the Haynes-Ionia Co., one of the biggest manufacturers of automobile bodies, and sheet metal parts in the country.

English Automobile Engineers Are Not Neglecting Development, Despite War

Water-Cooled Rotary Engine and Gas Turbine Under Way—Work on Sleeve-Valve Eight and Several Small Cars—A New Rear System

LONDON, ENG., Nov. 25—The great advance made by American automobile engineers during the course of the last two years has been obvious to the automobile world at large. There were many who prophesied at the outbreak of war, that, until its close, ordinary commercial progress would be largely stagnated. The automobile progress made in America has given the lie direct to such assertions. Even in Europe it has been commented on several times in English, French and German journals. The country most concerned, however, is certainly Great Britain.

While the actual causes of recent tariff on imported automobiles are undoubtedly cumulative, it is nevertheless an open secret that the advance made by American manufacturers in design, materials and workmanship was a potent factor in the deliberation of British manufacturers when they decided to approach the government for legislative protection. Had not American cars improved in the way they have, the British manufacturing trade would not have been so perturbed. It is admitted that so far as general specification goes, the American product is very far in advance of the British automobile speaking in terms of average—as it was known at the outbreak of war. One is led, therefore, to wonder what automobile manufacturing in England is doing. Is it sitting down calmly under fate, with hands tied by the force of circumstances, merely watching American progress in design? Is it able, while chiefly concerned with the production of munitions in its motor car factories, to give attention to the all-important question of automobile progress? A knowledge of the facts will come as a surprise to many people. Automobile England is very wide awake.

Study Engine Designs

A number of British manufacturers are deep in the study of engine design so far as the question of the number of cylinders is concerned. When the eight movement started in America it was not taken very seriously by the leading British manufacturers. Now, however, things are quite different. Not only is the eight being worked upon by several leading manufacturers, but in one case of importance at least, the twin six is engaging the serious consideration of the designing and experimental staff. Two experiments, they are no more as yet, go even in advance of American ideas, as in one case a water-cooled rotary engine is now being tried out experimentally by its inventor for a large manufacturer, and in another a new form of gas turbine is being finished off on paper. Of these two propositions the former is promising, though considerable trouble has been encountered in making the rotating flapper pistons gas tight.

In regard to the question of the eight and the twin six, however, matters are on a more substantial basis. A number of firms are working along these lines, and the results so far obtained are very good.

The chief engineer of a large firm is loud in praise of eight possibilities.

An Electric Gearshift

There is a very ingenious new electrically-controlled gearbox, which is finding much favor. To be able to make a perfect change by merely pressing a button on the steering wheel is undoubtedly an ideal method. It has already been proved possible and it now only remains to prove whether or not the invention is practicable as a manufacturing proposition and whether it will prove sufficiently reliable not to require the usual lever control as an emergency standby.

A Sleeve-Valve Eight

Then again, there is a sleeve-valve eight under way. Just before the outbreak of war, Minerva in Belgium was also busy with the design of a sleeve-valve eight. As this firm has proved the high efficiency of this type of engine in the racing world, its eight, if it sees the light of day, shall prove a very interesting proposition.

British manufacturers are studying the refinement of these new engines very carefully. Such things as the permanency of tappet adjustment, the elimination of vibration and the reduction of skin friction for the passage of the inlet and exhaust gases are studied just as carefully as detail units of design, as the whole proposition is as an engine. In a word, the British manufacturer who puts an eight on the market after the war is expecting to take a place right in the front with the new development. In just the same way as the Britisher has claimed superiority for his product on account of its excellence in material and workmanship in the past, so will he in the future on the new engine. If close application and careful experimenting are not behind their usual value, the eights to be marketed in the future by several leading British firms will undoubtedly be of a very high grade.

New Car Models

Even in England, the majority of motorists picture their own car factories as entirely engaged on the production of munitions. Speaking broadly, they are, but nevertheless a number of firms are still able to make cars, and a few are still being made and sold to the ordinary public. After the panic of the early days of war, British manufacturers naturally began to think of their future in the happy days when piping peace reigns once more. In most of the chief factories it has been found possible to do something in regard to new models, or redesigning the pre-war existing ones to bring them up to date. A number of actual new cars are on the road for test at the present time. It is, however, more important to know that the quality of the firms is first rate. Among such cases are several of the leading firms in Britain, though as the new cars are commercial secrets we cannot refer to them by name. A famous firm has an entirely new design of small car, like a Ford, so far as the idea of providing the maximum for a minimum outlay is concerned. It will probably be sold at a good deal less than half the cost of the cheapest car previously sold by the firm in question. The car itself is not only interesting as a designing proposition, but is a good performer. Acceleration and hill climbing are both markedly good characteristics, and the initial cost and upkeep are both low.

Two firms whose racing records are well known have also produced entirely new models. In one case it is a small car, much smaller and cheaper than the firm has previously produced and in the other case it is a much larger and more luxurious car. Then there is another firm that specialized on one model only, and a very popular one, before the war, that has brought out an improved form of the same general design, but larger and more commodious, and with a number of improvements. This firm is also carefully maturing plans for a quick continuation of its ordinary business routine so soon as the war is over, and its expectations of a large sale for the new model will in all probability be fully realized.

A New Rear System

One more case as indicative of the general trend in England may be cited and it is an important new entrant into the field of car production. A large firm of accessory manufacturers has the first chassis of its new venture on the

road, and the preliminary trials have been quite satisfactory. It is a small car largely on conventional lines, but with a new system of rear suspension which prevents the chassis from being on orthodox lines. It is early yet to prophecy either success or failure for this new venture, as it has only just seen the light of day so far as road trial is concerned.

It will be seen from the preceding information, that the idea so prevalent that England is not, and cannot, do anything to keep pace with automobile progress, is far removed from fact.

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Hercules Motor Mfg. Co. Formed with $500,000 Capital

CANTON, OHIO, Dec. 4—The Hercules Motor Mfg. Co. has been incorporated in this city with a capital of $500,000 by backers of the Ohio Motor Mfg. Co., which will soon build a large plant in the Aultman group.

The incorporators of the company are H. E. Black, E. A. Nist, J. M. Baer, H. L. Alexander and I. M. Chandler. The charter of the company authorizes it to manufacture, buy, sell and deal with motors and motor devices and internal combustion engines for use in automobiles, trucks, tractors and all self-propelled vehicles.

It has been decided to build in the Aultman group a plant 65 by 400 ft., two stories, at an estimated cost of $50,000. Work on the building will start at once. One hundred and fifty men will be employed. Under the direction of Charles Ballough, consulting engineer and designer, an organization is now at work at Springfield turning out sample motors, etc.

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Saxon Builds 19,036 Cars

DETROIT, MICH., Dec. 6—With the production for December estimated at 1500 cars, the total output of the Saxon Motor Car Co., for 1915, is estimated to be 19,063 cars, or 11,740 more than in 1914 when 7323 cars were made. The production for 1916 is planned to be for 30,000 cars or more. Figures for 1914 and 1915 are:

Month	Year 1915	Year 1914	Increase
January	706	....	706
February	844	13	831
March	1,041	470	571
April	1,738	762	976
May	2,024	1,255	769
June	2,710	1,787	923
July	1,658	618	1,040
August	1,799	876	923
September	1,158	641	517
October	1,935	460	1,475
November	1,950	175	1,775
December	**1,500	266	1,234
Total	19,063	7,323	11,740

**Estimate only.

By acquiring the four-story brick plant formerly occupied by the Studebaker Corp. on Franklin Street, the Saxon company has added nearly 60,000 sq. ft. of floor space to its plant which now has more than 120,000 sq. ft.

Business Booms in Southwest

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Car and Accessory Dealers Find Oil, Wheat and Cotton Boost Sales

KANSAS CITY, MO., Dec. 4—The month just ended brought a tremendous volume of business to the car and accessory dealers who supply the Southwest trade from here. With bank clearings in Kansas City making high record marks every year, with the wheat beginning to move from Kansas to the markets, with oil on the jump in Oklahoma after a big crop year, and with unusually open weather throughout the entire district, heavy sales have resulted and dealers expect their branches will enter the new year with practically no unsold cars on hand.

Record Bank Clearings

The bank clearings are, of course, the best barometer of the district. Three records were broken in the month of October, and in November the same story was repeated with a total for the thirty days of $394,019,925—the banner month in the history of the local clearing house association. The clearings for the entire year of 1914 were $3,015,811,567, but with the close of November this year has broken that high figure by $442,000,000. Bankers confidently expect the year's total to approximate $4,000,000,000.

The largest volume of local business comes, of course, from Kansas where the farmers have been blessed with a big wheat crop that commands unusually high prices and, because of the record yield of a year ago, have fewer mortgages and notes to pay off than in previous seasons. The 1914 crop cleaned up old debts that had been hanging over; the 1915 wheat will go largely into the purchase of automobiles, pianos, etc.

Oklahoma Doing Well

Oklahoma is doing well. The cotton crop was large, so was corn and wheat, and prices on all three products are high. Some sections of the State are experiencing their first good season in three years. They are buying cars heavily.

But of more importance to Oklahoma is the present oil boom that has steadily raised the value of the crude product at the well until now it is selling at $1 a barrel, with additional royalties being paid by some companies in order to meet their demands. Boom stories of new fields opened, of men suddenly rising to wealth, of scraggly land on which poor farmers have been scratching for a living for years turning into big production centers, and of persons holding old leases cashing them in for big profits and easy money.

Missouri has not been so fortunate, however. Rains throughout the summer cut down the grain crops somewhat but business conditions throughout the State are sound. The mining districts of the southwestern section of the State are producing heavily to meet the war-time prices.

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Prosperity Hits the South

LOUISVILLE, KY., Dec. 3—Southern automobile dealers, branch managers, factory representatives and manufacturers are elated over the remarkable business expansion in the South, which is one of the outstanding features of the prosperity now sweeping the country. This means an increase in the sale of automobiles, it is predicted.

Optimism is in evidence everywhere, and those in close touch with the automobile trade in the South declare that 1916 will be the biggest year in the history of the industry below the Mason and Dixon line. A conservative estimate, based on interviews with leading dealers, points to an increase of about 50 per cent in the sales during the past four weeks over the same period last year. Some say they have sold twice as many cars.

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Willemin Resigns from Hupp

DETROIT, MICH., Dec. 4—A. B. Willemin, who was assistant general manager of the Hupp Motor Car Co., has resigned.

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Jarman with Canadian Briscoe

JACKSON, MICH., Dec. 4—Walter G. Jarman has been appointed treasurer and general manager of the Canadian Briscoe Motor Co., and will locate in Brockville, Ont. Mr. Jarman has been assistant sales manager of the Briscoe company here

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Lewis Joins Campbell-Ewald Agency

DETROIT, MICH., Dec. 4—E. St. Elmo Lewis, one of the best known advertising and sales executives in the country, has joined the Campbell-Ewald Co., advertising agency, as advertising and sales counsel.

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Revoke Drawbacks to Members of Old A. L. A. M.

WASHINGTON, D. C., Dec. 6—Secretary of the Treasury has informed the collector of customs at New York that in view of the fact that treasury decision of Dec. 19, 1908, providing for the payment of drawback on automobiles manufactured by members of the A. L. A. M. with the use of imported materials, has become inoperative as to a large number

of the members of said association and that conditions of manufacturing have changed to a great extent since the promulgation of said decision, the same has been revoked, the revocation to become effective as to all shipments exported on and after Dec. 24. The department has advised all members of the revocation and that an application for a new rate of drawback must be made by each member to cover shipments after Dec. 24.

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Price Advanced 1 Cent on Gasoline for Export

NEW YORK CITY, Dec. 6—The Standard Oil Co. of New York has advanced the export price of gasoline 1 cent a gallon, covering all grades and all packages, to take effect at once.

Unprecedented demand, it seems, instead of reducing the price of gasoline has had an opposite effect. One effect of the high cost of gasoline is the inability of the Standard Oil Co. to supply the demand.

An unforeseen shortage in Oklahoma is the main factor in the present high prices. Last year the fields in that State produced between 300,000 and 400,000 barrels of crude oil per day and it was expected that the production would be kept up for at least two years. Suddenly the fields seemed to peter out and the production at present is about 100,000 barrels per day.

Added to the large domestic demand is that of Europe, which is using more gasoline than it was in time of peace and producing very little. Its importation is almost entirely from the United States, the quantity obtained from Canada being very small. What is being produced in Russia and Galicia is not known.

With this large European demand on hand, the Standard Oil Co. has been hampered by the scarcity of ships. England has taken out of the market 115 ships that were available for use. This company uses tank steamers or carriers to transport much of the crude from Texas, Mexico and South America and there is danger of confiscation by the belligerents. The company was paying $3.50 per day per ton on chartered boats but the scarcity has brought the price up to $42.

In Georgia gasoline has been advanced in price on the tank wagon basis, 1 cent a gallon, at all stations in Georgia and Alabama. The price at Atlanta is now 21 cents and at Savannah 19 cents.

The Atlantic Refining Co. has advanced the price 1 cent to 19 cents a gallon in Pittsburgh.

The price of gasoline advanced another cent throughout Southern California to-day, now selling for 15 cents in Los Angeles where it sold for 11 cents but a few weeks ago.

Export Shipments Tied Up

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Freight Congested—Use of Open Cars Advised to Alleviate Conditions

NEW YORK CITY, Dec. 7—The congestion of freight at this and other export shipping cities along the Atlantic Coast has caused much concern to the automobile traffic managers in Detroit and other cities. It is estimated that 65,000 cars are tied up at or near New York City alone.

On account of the present condition of affairs the traffic department of the National Automobile Chamber of Commerce has given its advice on how to alleviate this and to expedite shipments. By the shipment of automobiles in open cars instead of in the now much scarce closed cars, it is advised that the present scarcity of automobile equipment, will at least be relieved. It is stated that automobiles, passengers or freight, for export, can safely be shipped on open cars, and in fact a considerable proportion of the shipments have been made on such cars.

Another suggestion is made in the way shipments are made. Railroad officials have stated that many of the automobile factories are loading for export mixed carloads of automobiles containing machines for different countries and which have to be lightered to two or more steamship lines. This has resulted in delay to cars in which part of the lading is left over, and this has happened even when the same factory a few days later shipped a similar mixed lot. In other words, straight carload lots containing machines all for the same country or steamship line, should be planned.

The free time allowed on export shipments will be reduced from thirty to fifteen days by tariff publication effective Jan. 1, 1916. Automobile shippers should therefore forward only shipments for which ocean space is positively booked and assured.

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$2,627,000 in Cars and Trucks from N. Y.

NEW YORK CITY, Dec. 6—Exports of automobiles, trucks, tires and parts during the week ending Nov. 20, from this city to the belligerent countries amounted to $2,627,000, divided as follows: Trucks, $1,479,000; automobiles, $574,000, and automobile parts and tires, $574,000.

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Annual Tax for District of Columbia?

WASHINGTON, D. C., Dec. 6—An entire change in the method of assessments for taxation and operation of automobiles in the District of Columbia is proposed by the Commissioners in their report to Congress made to-day. The commissioners desire that instead of assessing automobiles as personal property and issuing a license tag that is good indefinitely, an annual license for the operation of such machines shall be charged in lieu of the personal tax. The proposed new legislation provides that on and after Dec. 31, 1916, all licenses, including identification tags and registrations for motor vehicles heretofore granted shall become void and on and after Jan. 1, 1917, there shall be charged annually for the licensing and registration of motor vehicles a sum to be fixed by the District Commissioners.

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New Law for New York?

NEW YORK CITY, Dec. 8—As the result of a conference between Police Commissioner Wood, Secretary of State Hugo and Chief Magistrate McAdoo, a bill for regulating automobile traffic has been prepared for presentation to the Legislature.

It provides that all operators and owners of automobiles must obtain licenses from the secretary of state, who will have a corps of examiners. The secretary of state is given power to revoke licenses for violations of the traffic regulations, after a hearing, except in cities of the first class, where the power of revocation will rest with the police commissioner.

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Iowa Owners Must Register Cars by April 1

DES MOINES, IOWA, Dec. 4—W. S. Allen, Secretary of State in Iowa, rules that only owners of automobiles who will not use their cars in 1916 will be relieved of the necessity of registering their machines before April 1. Penalties will be assessed for failure to register by that date. Under the old law automobile owners who did not intend to use their cars before June or July were not required to register their machines before that time but the new law requires registration before April 1 if the car is to be used at any time during the year.

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Truck Speed Limit in Maryland

BALTIMORE, MD., Dec. 4—Harry A. Roe, motor vehicle commissioner for Maryland, has taken a decided stand against motor trucks and jitney buses. He has made an investigation and has found that the heavy trucks are going too fast and that the jitneys are being overcrowded. He has sounded a warning.

The speed limit for trucks weighing from 4 to 8 tons has been fixed at 15 miles an hour as the maximum, and those weighing over this amount at 12 miles an hour.

Bay State Bars Speed Runs

Dealers' Licenses Suspended for 1 and 2 Weeks—Highway Com. Issues Warning

BOSTON, MASS., Dec. 4—The license of the Donovan Motor Car Co., agent for Studebaker cars in Boston and vicinity, was to-day suspended for one week, and the licenses of Edward P. Sheehan, Boston, and Milton W. Reed, Lynn, Mass., were suspended for two weeks as an aftermath of the recent 1000-mile reliability run of the Studebaker car here. It is the first time that the license of any dealer has been suspended, and this drastic action is taken so that other dealers may be warned against holding such tests in the future.

The Highway Commission has served warning that hereafter any participants in reliability runs in which speed is a factor will be dealt with very severely. The action was a surprise to the Boston dealers, and it will be very amazing to others throughout the State. While the present motor vehicle law does not put a limit on the speed of a driver, merely saying that he must drive at a speed reasonable and proper, according to traffic conditions, there is another section that has a bearing on the case. This section has a clause reading:

"Whoever . . . operates a motor vehicle for the purpose of making a record and thereby violates any provisions of sections 16 and 17 of this act, etc., shall be punished by a fine of not more than $200 or by imprisonment for a term of not less than two weeks nor more than two years, or by both such fine and imprisonment."

To Stop Speed Tests

Sections 16 and 17 refer to speed regulations. While neither of the drivers was in court, the Highway Commission has the authority to deal with cases like theirs, and as the feat of the car got such wide publicity the members of the commission decided it was time to call a halt on future tests. The commission received a number of letters about the run and so it summoned the drivers and Mr. Donovan before it for an investigation before it acted. The commission issued the following statement:

"The Massachusetts Highway Commission to-day suspended for a period of two weeks the licenses of Edward P. Sheehan of Boston, and Milton W. Reed of Lynn because they operated an automobile for the purpose of making a record; and it also suspended for a period of one week the dealer's registration certificate of the Donovan Motor Car Co., Boston, the owner or concern in control of the automobile in question.

"It appeared from newspaper accounts that on Nov. 10, 1915, a Studebaker car was operated upon the highways of Massachusetts and adjoining States at an extremely high rate of speed. A hearing was given by the commission to-day, at which it appeared from the testimony that the car was operated under orders of the manager of the Studebaker company for the purpose of making an endurance record, and that an average speed of more than 30 miles an hour was maintained for the greater part of the distance.

Contrary to Law

"Such use of the highway is contrary to law, which prohibits the operation of automobiles on the highways for the purpose of making a record; and the commission desired to take this occasion to call the attention of all automobile agents and operators of motor vehicles to the fact that no automobile tests, records or races will be permitted on the highways of this commonwealth.

"As this is the first case of this kind that has been called to the attention of the commission, it has made short suspensions, because the parties were somewhat ignorant of the law and of their rights in the premises, and the commission feels that the parent corporation was more responsible than the operators or agent, who were acting under orders of the parent company.

Warning for Future

"The commission hopes that the newspapers will give this case full publicity, so that the public will have full notice of it, and of the fact that future cases of this kind will not be dealt with as leniently."

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Booth Resigns from Chalmers

DETROIT, MICH., Dec. 7—C. H. Booth, who was a district sales manager for the Chalmers Motor Co. has resigned. No successor has as yet been named. The territory of Mr. Booth included the States of Michigan, Ohio, Indiana, Kentucky.

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Link Joins Wilson Truck

DETROIT, MICH., Dec. 4.—Vincent Link has been appointed designing engineer of the J. C. Wilson Co., this city, manufacturer of Wilson trucks. He was formerly with the Packard Motor Car Co.

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Keller a Maxwell Supervisor

DETROIT, MICH., Dec. 7—W. H. Keller has been appointed supervisor of zone "C" by the Maxwell Motor Sales Corp. His headquarters will be located in Pittsburgh.

Full Measure in Bay State

To Prosecute Makers and Dealers Where Liquid Containers are Under Size

BOSTON, MASS., Dec. 4—Thure Hanson, commissioner of weights and measures for Massachusetts, has started out to make dealers in oils and other liquids used in the motor industry give full capacity to their customers. He has been investigating quietly for some time into all kinds of oils and liquids used in cleaning and preserving parts of automobiles. His investigators have found discrepancies in the weighing and measuring which can be traced back to the manufacturers.

A large portion of the cans tested were short by from 1 to 4 fluid ounces. These discrepancies make considerable difference in the cost of the material and the loss to the buyer in some instances was as high as 14 cents a can. So Commissioner Hanson declared that he has decided to follow up this line of investigation and make prosecutions. He does not intend to prosecute the retail dealer at first, but will notify him not to sell under weight products.

The manufacturer will be notified to give full measure or he will be prohibited from selling his goods in Massachusetts. The commissioner says that he estimates that the buyers lose from $25,000 to $50,000 a year on these underweight products. Notifications have been sent to some producers already.

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L. P. C. May Pay All Debts

RACINE, WIS., Dec. 4—Under an arrangement effected by creditors of the L. P. C. Motor Co., Racine, Wis., which made a voluntary assignment some time ago, it is believed that all debts will be paid in full and the business rehabilitated without the loss of a cent to creditors. As was announced at the time of the assignment, the company practically closed a large contract for cars and similar material. The Corliss Steel Co. of Racine has been organized by F. Lee Norton, the assignee; Capt. William Mitchell Lewis, president, L. P. C. Motor Co., and Herbert F. Johnson, to handle this contract as well as take over the business of the L. P. C. and assume the liabilities. It is proposed to use a large part of the former plant of the defunct Wisconsin Engine Co. at Corliss, Racine County, to which location the L. P. C. shops will be moved within a short time. The Corliss Steel Co. is licensed to do business on a broad scale in cars, tractors, machinery, etc.

Reliance Takes Over Seager Works

Engineering Co., Controlled by Lansing Men, to Make Automobile Parts

LANSING, MICH., Dec. 2.—The merger of the Seager Engine Works and the Reliance Engineering Co. is now an accomplished fact. Negotiations had been pending for several weeks, as was briefly reported in THE AUTOMOBILE for Nov. 11. The deal just completed, whereby the Reliance company takes over the Seager works, also means that the Rumely Co. ceases to have any connection with the new organization.

The officers of the Reliance company now are: C. P. Downey, president; Fred. L. Smith, vice-president; E. C. Shields, secretary; J. H. Wilford, treasurer. These officers and Henry Russell, John M. Stalker and B. F. Davis, form the board of directors. Lansing men now control the company.

Besides continuing to make gas engines, the reorganized company is expected to make ultimately the manufacturing of automobile parts its principal business. The machinery of the Reliance company is being removed to the Seager plant which covers about 18 acres of ground and whose tangible assets were estimated at $1,500,000. It will take some time yet to readjust all matters so that production will be at its maximum, but men are being added as fast as it is possible to get skilled workers.

Burd Ring in New Plant

ROCKFORD, ILL., Dec. 4—The Burd High Compression Ring Co. has moved into its new factory at Twenty-third Avenue and Tenth Street, this city. The new plant is 190 by 129 ft., having 19,000 sq. ft. available for manufacturing purposes. It is capable of turning out 25,000 piston rings per day and of employing 250 men.

New Plant for Gile Tractor

LUDINGTON, MICH., Dec. 1—The Gile Tractor & Engine Co. is to have a new plant, a one-story building, 200 by 40 ft., which will be connected with the present plant by a 20-ft. driveway. There are eighty men now on the company's payroll. When the new plant is ready at least 200 men are to be added.

McLaughlin to Double Output

OSHAWA, ONT., Dec. 3—At the annual meeting of the McLaughlin Motor Co., R. S. McLaughlin was elected president. Vice-president is C. Hezzelwood, treasurer G. W. McLaughlin and secretary G. W. Hezzelwood. Directors are: R. McLaughlin, Charles W. Nash and Thomas Neal. The action of the directors in selling the stock of carriage parts to the Canada Carriage Co. of Brockville was confirmed, as was also the building of a large addition to the plant.

It was decided that the output of the plant should be more than doubled during 1916 to keep pace with the increased demands.

Mason Plant Nearly Finished—1000 More Men

FLINT, MICH., Dec. 3—The new plant of the Mason Motor Co., which makes the motors for the Chevrolet Motor Co. of Michigan, and is controlled by it, is nearly completed and that part of it will be operated within a few days.

Men are being added as fast as it is possible to accommodate them, and by next April at least 1000 will be added to the force at the Mason plant alone. At the Chevrolet car plant it is expected to add 500 or more, and this would be done at once if enough houses were available in the city.

Pending the construction work of the new factory buildings the Chevrolet company has been using parts of the plant of the Monroe Motor Co., also the plant of the old Standard Rule Co. Arrangements have been made whereby the occupancy of these premises or parts of them will be continued idefinitely.

It was also announced to-day that William C. Durant is now president of the Chevrolet Motor Co. of Delaware, recently incorporated. The officers of the three Chevrolet companies are now as follows:

Chevrolet Motor Co. of Delaware—holding company, capitalized at $20,000,000: William C. Durant, president; A. B. C. Hardy, first vice-president; E. R. Campbell, second vice-president; W. C. Sills, treasurer; J. T. Smith, secretary. Board of directors, R. L. Higgins, chairman; L. G. Kaufman, H. M. Barksdale, N. Hofheimer, J. W. Prentiss, B. Lockwood and the officers of the company. Mr. Kaufman is chairman of the finance committee.

Chevrolet Motor Co. of Michigan: C. M. Begole, president; William C. Durant, first vice-president; A. B. C. Hardy, second vice-president; W. S. Ballinger, treasurer; C. R. Hathaway, secretary. Directors—the officers and A. G. Bishop and E. R. Campbell.

Chevrolet Motor Co. of New York: William C. Durant, president; W. C. Sills, vice-president; E. R. Campbell, secretary-treasurer.

Grinnell Electrics Discontinued

DETROIT, MICH., Dec. 1—The Grinnell Electric Car Co., which started in business in 1910 and made the Grinnell electric, has discontinued its manufacture.

Chevrolet Factory for K. C.

Assembling and Storage Plant To Be Built—Another in St. Paul

ST. LOUIS, MO., Dec. 2—Reports from Kansas City, Mo., that the Chevrolet Motor Co. plans to erect an assembling plant in that city were confirmed here to-day by Russel E. Gardner, Jr., vice-president of the St. Louis Chevrolet Co. Mr. Gardner added, however, that while the Kansas City branch will supply only the trade in the Kansas City district, the St. Louis factory will be the center of Chevrolet activities in the Middle West.

Chevrolet Plant for St. Paul

ST. PAUL, MINN., Dec. 4—The Chevrolet Motor Car Co. will erect a four-story steel and brick storage and assembling plant to cost $500,000 at University and Emerald Avenues, near the Minneapolis boundary line. The site is near those of the Overland and Twin City Four Wheel Drive plants. It has a frontage of 264.14 ft. and a depth of 503 ft.

Republic Brass Co. Organized

PONTIAC, MICH., Dec. 2—The Republic Brass & Bronze Co. has been formed here. It has a capital stock of $25,000, of which $13,000 has been paid in cash. The plant of the Pontiac Motor Castings Co. has been purchased by the new company. Under the supervision of general manager A. C. Sheerer, the plant is being repaired and remodeled. All kinds of brass, bronze and aluminum castings will be made.

Exhaust Heater Co. Formed

GRAND RAPIDS, MICH., Dec. 3—The Auto Exhaust Heater Co. has been organized to make a device to be used for heating automobiles in cold weather. Those interested in the new concern are: Don McAfee, Frank Veit, T. Johnson, Frank Mathison and Neil Kunst.

Ford's Son in Charge

DETROIT, MICH., Dec. 3—A young man of 22 is to-day at the head of two automobile manufacturing concerns, whose total business during their 1915 fiscal year aggregated over $100,000,000. This young man is Edsel B. Ford, son of Henry Ford.

Young Mr. Ford has been given full power of attorney by his father and during the latter's absence, which will be from five to six weeks, it is said, he will be the president of the Ford Motor Co., Detroit, the Ford Motor Co. Ltd. of Canada and the new firm, Henry Ford & Son, Dearborn, Mich., which is to build the tractors.

At the close of the business day yesterday the Ford company had orders on its books for immediate delivery for 105,289 cars, which, however, does not include cars to be shipped this month. In other words, this represents the number of cars ordered but for which the company is behind on deliveries. Since the beginning of the 1916 fiscal year, or since Aug. 2, approximately 140,000 Fords have been made and shipped. This represents the production and shipments from all the assembling plants throughout the country in addition to the activities of the parent plant here.

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Ford Buys Brooklyn Land

DETROIT, MICH., Dec. 4—The Ford Motor Co. has purchased a plot of ground on the Eastern Parkway, near Bedford Avenue, Brooklyn, N. Y., where a new service station and assembling plant will be erected to take place of the service station and branch now located at 1476 Bedford Avenue. The new building will be of irregular shape, three stories high, with basement.

In Scranton, Pa., the Ford company will put up a new branch. The three-story structure will be 175 by 90 ft.

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Myers Machine Co. Adds

SHEBOYGAN, WIS., Dec. 4—The Myers Machine Co., Sheboygan, Wis., which has been reincorporated and capitalized at $50,000 to include the plant and business of the Wisconsin Motor Truck Co., Baraboo, Wis., has awarded contracts for the erection of a 75 by 75 ft. shop addition to accommodate the truck shop. The line will consist of 1500-lb., 1-ton and 2-ton worm driven trucks. Police and fire cars will be made to order. The Myers company is now buying the new equipment needed.

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Gillette Tire Starts Factory

EAU CLAIRE, WIS., Dec. 4—Work has been started by the Gillette Safety Tire Co., formerly of Grand Rapids, Mich., on the first unit of its permanent factory and offices here. The building will be of reinforced concrete construction, 60 by 250 ft., located on a tract 150 by 300 ft. and placed so that wings may be constructed as needed. The initial output will be 100 tires daily, and the concern is engaging seventy-five tiremakers and twenty-five apprentices. The company is capitalized at $1,000,000 and has been in existence two years.

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Jaeschke Foundry To Expand

MILWAUKEE, WIS., Dec. 4—The Jaeschke Bros. Foundry Co., 3026 Locust Street, Milwaukee, is building a new foundry and pattern shop at Cawker Place, Thirtieth Street and the Milwaukee road tracks. It will be of brick, one-story, 120 by 150 ft., of modern design throughout, and will cost $20,000.

Niles Co. To Build Trucks

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Interurban Car Manufacturer Will Turn Out General Delivery Type

NILES, OHIO, Dec. 4—The Niles Car & Mfg. Co., which has been confining its attention to the manufacture of interurban cars, will soon turn out motor trucks for general delivery purposes, according to an announcement made recently. The matter had been under advisement for some time by the directors of the company and because of the fact that an amendment must be made in the charter of the corporation, a stockholders' meeting has been called.

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Packard to Build 12,000 Cars

ST. LOUIS, MO., Dec. 7—The Packard output for 1916 will be 12,000, an increase of 4500 or 60 per cent over 1915, according to H. H. Hills, general sales manager of the parent company, at a meeting of Middle West dealers here to-day. Dealers from twenty-four leading cities met the factory officials and exchanged views as to delivery, output and service possibilities for 1916.

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Moline Plow Buys Cultiplow

COLUMBUS, OHIO, Dec. 7—The Moline Plow Co. has purchased the manufacturing rights for the Universal Cultiplow heretofore produced by the Universal Tractor Mfg. Co., though it has not taken over this company. The Universal company will discontinue. F. B. Funk is engineer and factory manager of the tractor department of the Moline Plow Co., and S. C. Turkenkoph will be assistant to the sales manager of all departments and the company's tractor expert. The Moline company will build tractors on a much larger scale than possible by the Universal Tractor Mfg. Co.

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Firestone Plans More Additions

AKRON, OHIO, Dec. 4—Permits have been taken out by the Firestone Tire & Rubber company for four new buildings to enlarge its plant. Two of the buildings will be five stories high and the others one story. The cost of the structures is estimated at $75,000.

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Midland Supply Succeeds Positive

DAVENPORT, IOWA, Dec. 4—The Positive Supply Co., this city, has been dissolved and the business will be continued under the name of the Midland Supply Co. with which it has been consolidated. In the consolidation W. G. Sanford, formerly president of the Positive company becomes vice-president of the Midland organization, J. Reed Lane, president and Maurice Hemsing, secretary and treasurer.

The consolidation does not affect the sales force, business policies or contracts now in force of the Positive Supply Co., which has been marketing a steam vulcanizer for several years, together with several accessories.

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356 Studebakers in 1 Day

DETROIT, MICH., Dec. 6—The Studebaker Corp. broke its one day production record Nov. 27, when 356 cars were made or nine more than the former high mark.

DETROIT, MICH., Dec. 4—The plant of the Studebaker Corp. at West Jefferson and Clark Avenues, will be greatly enlarged, and a first permit for a steel frame and concrete addition, to cost $35,000 has been secured from the building department.

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Jeffery Adds Two Buildings

KENOSHA, WIS., Dec. 4—The Thomas B. Jeffery Co., Kenosha, Wis., has started work on two large factory buildings, each three stories high, to provide much-needed production facilities in both passenger and commercial car departments. The company has been working night and day for many months and is at this time employing 2500 men, compared with 1300 on the payroll a year ago.

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Vim Starts New Plant

PHILADELPHIA, PA., Dec. 4—The Vim Motor Truck Co. has started work on its new six-story concrete factory building at Twenty-third and Market Streets. The building will cost about $750,000. It will be completed in the spring, covers a lot 200 by 400 ft. and will contain 64,000 sq. ft. on each floor.

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General Tire Moves to Akron

KANSAS CITY, MO., Dec. 3.—The Western Tire & Rubber Co., formerly of this city, has moved its plant to Akron, Ohio, where it is incorporated under the name of the General Tire & Rubber Co., with a paid-up capital stock of $200,000. The personnel of the company will remain the same. Equipment is being installed in the new 60 by 160 ft. plant.

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Knox Strike Settled

SPRINGFIELD, MASS., Dec. 7—The machinists strike at the plant of the Knox Motors Co., this city, which lasted for a few days, has been settled to the satisfaction of both the Labor Union and the company.

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Kundtz Strike Ended

CLEVELAND, OHIO, Dec. 4—The strike of 1800 workmen at the plant of Theodore Kundtz, maker of automobile bodies and parts, was settled to-day, having lasted over a month.

Commerce Truck Gains 150%

To Double Capital—1915 Earning May be $70,000—Stock Dividends Probable

DETROIT, MICH., Dec. 4.—At a meeting of the board of directors of the Commerce Motor Car Co., manufacturer of the Commerce trucks, it was decided to increase the capital stock of the company from $100,000 to $200,000. A meeting of the stockholders will be held Dec. 14, at which they will be asked to decide whether a stock dividend of 50 per cent, as recommended by the directors, be paid to stockholders of record Dec. 15. The earnings of the company are expected to total about $70,000 this year, which is 70 per cent of the former capital stock. It is not likely that cash dividends will be paid for some time, but, it is possible that another stock dividend of 33 1/3 per cent will be paid early next year.

The Commerce Motor Car Co. started in business in 1910 and has been making trucks only. This year its business has been exceptionally good. According to the officers of the company its sales have been 150 per cent better than during any previous year.

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Denby to Increase Stock $500,000 to $750,000

DETROIT, MICH., Dec. 4—The Denby Motor Truck Co., has decided to increase its capital stock from $250,000 to $750,000, of which $500,000 will be common and the balance of $250,000 will be preferred. The present capital is all common. None of the new stock is to be placed on the market, and, it is said that it is being subscribed for directly at par, while a common stock bonus estimated at 65 or 70 per cent is being given with the sale of all preferred. The entire matter in connection with this increase of capital of the Denby company has been done quietly and it is said that the greater part of the new stock has been subscribed for by the present stockholders, President Garvin Denby and his brother Edwin, who is treasurer of the company, having it is said, a majority of the stock.

The Denby company started in business in July, 1914, and its business has been gradually increasing until it has become necessary to increase the capital stock and provide for greater production facilities. The plans for the contemplated increased activities of the company are not completed.

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Sales Record for Jeffery Quad

KENOSHA, WIS., Dec. 6—The Thomas B. Jeffery Co. made a record in sales and production when it was announced that over 2000 Jeffery Quads of 2 tons or over, were built, bought and delivered.

The company has set aside the month of December as Quad Month. During this month demonstrations are being carried on by its dealers in practically every part of the world.

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Aluminum Lower

NEW YORK CITY, Dec. 7—Market prices this week were subject to many changes. A number of the metals were lower, especially copper, tin and aluminum. Rubber, after an 8-cent drop last week, fluctuated throughout the week, but managed to hold at the 70-cent mark, 2 cents higher than the opening price on Tuesday. The copper market was quiet with prices prevailing at 19½ cents a pound. Tin weakened in price on account of the arrival of a large shipment of that metal from London. Quotations prevailed at $38 per 100 lb., or $1.75 lower. Aluminum has dropped to 56 cents with an easy market. Lead is now quoting at $5.22½ per 100 lb. Rubber from Ceylon is quoting at 85 cents with a light inquiry from the manufacturers. Bessemer steel and open-hearth steel rose $1 and $2, respectively per ton or to $29 and $30 per ton, respectively.

Pennsylvania crude petroleum rose to $2.10 a barrel on Friday. Rapeseed oil rose to 87 cents; linseed oil dropped 1 cent to 62 and cottonseed oil rose 25 cents to $8.34 a barrel. Cyanide potash rose 5 cents to 28 a pound. The rest of the oils and lubricants remained unchanged.

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Federal Business Gains 25%

DETROIT, MICH., Nov. 27—While this time of the year was always dull with the Federal Motor Truck Co., this year business has been uninterruptedly good and there has been no sign of a dull season. The output for 1916 will go at least 25 per cent better than double the 1915 output. Work on the additions to the plant is progressing rapidly. Federal dealers and distributors have been sending in most optimistic reports as to their business outlook. The company will help its dealers more than ever and has appropriated more money than heretofore for advertising purposes.

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Briscoe and Argo Buy Jackson Motor Parts Co.

DETROIT, MICH., Dec. 8—*Special Telegram*—The Briscoe Motor Co. and its affiliated concern, the Argo Co., have purchased the Jackson Motor Parts Co., which is a machine shop to do work for both Briscoe and Argo concerns. The machinery which was in the plant formerly occupied by the defunct Mason Motor Co. at Waterloo, Iowa, has also been purchased and is now in the plant of the Jackson Motor Parts Co. This deal gave rise to report that Briscoe intended operating a plant at Waterloo. Frank Briscoe confirmed the report that the Swift interests of Chicago some time ago secured a large interest in the Briscoe and Argo companies, but he refused to give details.

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Moore with Service Truck

WABASH, IND., Dec. 4—Paul Moore has been appointed advertising manager of the Service Motor Truck Co., Wabash, Ind. He comes from the advertising department of the Weis Fibre Container Corp., Monroe, Mich., and was formerly connected for three years with the advertising department of the National Cash Register Co.

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Hupp Re-Financing Approved

DETROIT, MICH., Dec. 3—The stockholders of the Hupp Motor Car Co. have approved the plan of refinancing and extension, which was reported in THE AUTOMOBILE for Nov. 25, whereby the assets and business of the Hupp company are taken over by the Hupp Motor Car Corp., incorporated under the laws of Virginia.

Daily Market Reports for the Past Week

	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Week's Ch'ge
Aluminum	.57	.57	.57	.56	.56	.56	— .01
Antimony	.38	.38	.38	.38	.38	.38½	+ .00½
Beams and Channels, 100 lb.	1.87	1.97	1.97	1.97	1.97	1.97	+ .10
Bessemer Steel, ton	28.00	28.00	29.00	29.00	29.00	29.00	+1.00
Copper, Elec., lb.	.19¾	.19¾	.19¾	.19½	.19½	.19½	— .00¼
Copper, Lake, lb.	.19¾	.19¾	.19¾	.19½	.19½	.19½	— .00¼
Cottonseed Oil, bbl.	8.09	8.24	8.19	8.23	8.29	8.34	+ .25
Cyanide Potash, lb.	.23	.23	.23	.23	.28	.28	+ .05
Fish Oil, Menhaden, Brown	.48	.48	.48	.48	.48	.48	...
Gasoline, Auto, bbl.	.19	.19	.19	.19	.19	.19	...
Lard Oil, prime	.92	.92	.92	.92	.92	.92	...
Lead, 100 lb.	5.25	5.25	5.22½	5.22½	5.22½	5.22½	— .02½
Linseed Oil	.63	.63	.63	.63	.63	.63	— .01
Open-Hearth Steel, ton	28.00	28.00	30.00	30.00	30.00	30.00	+2.00
Petroleum, bbl, Kansas, crude	1.00	1.00	1.00	1.00	1.00	1.00	...
Petroleum, bbl., Pennsylvania, crude	2.00	2.00	2.00	2.10	2.10	2.10	+ .10
Rapeseed Oil, refined	86	.86	.86	.86	.87	.87	+ .01
Rubber, Fine Up-River, Para	.68	.67½	.70	.72	.70	.70	+ .02
Silk, raw, Italian	...	...	5.25	...	...	5.25	...
Silk, raw, Japan	...	...	4.80	...	...	4.90	+ .10
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	39.75	39.00	38.50	39.00	39.00	38.00	—1.75
Tire Scrap	.05¼	.05½	.05¼	.05¾	.05¾	.05¾	+ .00½

The control of the organization has been obtained by the old stockholders, and the officers of the corporation are: J. Walter Drake, president; Joseph R. Drake, vice-president and secretary and Edwin Denby, treasurer.

The capital stock of the corporation is $8,000,000, of which $5,000,000 is common and $1,500,000 preferred. The balance of authorized stock or $1,500,000 was made necessary by the fact that the preferred stock is convertible into common stock at par and as long as the preferred stock is out an equal amount of common stock must be in the treasury. Thus, while the total capitalization is $8,000,000 the working capital is $6,500,000.

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S. T. Davis Estate $261,645.33

BRIDGEPORT, CONN., Dec. 4—Samuel T. Davis, Jr., late president of the Locomobile Co. of America, had an estate worth $261,645.33 according to a report filed by appraisers appointed by the court.

The greater portion of the estate consists of Locomobile stock, 1165 shares of preferred worth $58,250 and 5115 shares of common worth $51,160. The other large amount contained in the report is a life insurance policy worth $103,024.61.

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Dividends Declared

Rubber Goods Mfg. Co.; quarterly of 1¾ per cent on preferred, payable Dec. 15 to stock of record Dec. 10.

American Can Co.; quarterly of 1¾ per cent on preferred, payable Jan. 1 to stock of record Dec. 16.

Kelly-Springfield Tire Co.; quarterly of 1½ per cent on 7 per cent second preferred, payable Jan. 3 to holders of record Dec. 15.

Automobile Securities Firm

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General Motors Reaches High Mark of 530—Ajax-Grieb Common Goes Up 25

NEW YORK CITY, Dec. 8—Automobile stocks were yesterday under pressure owing to the direct application of some feature of the President's taxation proposals to them. The proposed tax of 1 cent per gallon on gasoline and naphtha is calculated to affect the profits of automobile companies. In the same way the tax of 50 cents per horsepower will add to the cost of these articles. The net effect of the message was to lower General Motors 9 points for the day. Maxwell Motors, on the other hand, finished at a net gain of ½ point from Monday's final quotation, though at a loss of 2½ points from the high figure of the day. Willys-Overland was an exception. It ended at 246, the high figure, representing a net gain of 6½ points for the day.

General Motors made a new high mark of 530, Monday, gaining 37½ points for the day. The preferred closed at 123½, over 6 points higher than Saturday's quotations. Goodrich was a strong feature Monday at 75½. Some activity was also shown in U. S. Rubber to the accompaniment of reports that both companies had laid in a large supply of crude rubber prior to the advance in the price of that commodity.

Ajax-Grieb common closed on Saturday at 375, or 25 points higher. Chalmers common made a 5-point gain, closing at 150. Electric Storage Battery, which has shown little activity, came to the fore last week with a 1⅛ point rise. Packard common, which has been showing much activity, rose 5 points, while its preferred went up 1 point. Peerless Corp. stock rose 2½ points.

A number of drops occurred in the tire issues. Firestone common, which has been holding strong at 700, declined 10 points. Goodyear common and preferred went down 8 and 1 point, respectively.

The Detroit quotations were featured by a 17½ point rise in General Motors which reached the 460 mark. With the exception of a 9-point rise in Packard common, the rest of the stocks showed small changes.

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Clifton Guest at N. A. C. C. Lunch

DETROIT, MICH., Nov. 30—At to-day's luncheon of the Board of Commerce, Charles Clifton, president of the National Automobile Chamber of Commerce, Inc., and treasurer of the Pierce-Arrow Motor Car Co., Buffalo, N. Y., was the honored guest and speaker. About 250 prominent men in the automobile industry, not only from this city, but from other States, listened to Mr. Clifton's talk on Co-operative Competition.

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Pa. Chauffeurs Are Domestics

PHILADELPHIA, PA., Dec. 4—At a recent meeting of the Workmen's Compensation Board, which will carry out the provisions of the new Pennsylvania act, it was ruled that ordinary private chauffeurs are engaged in domestic service and therefore do not come within the meaning of the act.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co. com	250	..	375	420	+25
Ajax-Grieb Rubber Co. pfd	100	..	101	110	..
Aluminum Castings pfd	..	..	..	..	..
J. I. Case pfd	..	..	88	90	..
Chalmers Motor Co. com	..	94	150	160	+5
Chalmers Motor Co. pfd	..	97	102	104	..
Chevrolet Motor Co	..	..	130	132	..
Electric Storage Battery Co	48	49	67	69	+1⅛
Firestone Tire & Rubber Co. com	235	240	690	705	—10
Firestone Tire & Rubber Co. pfd	109	112	112	..	..
General Motors Co. com	75	77	490	495	+35
General Motors Co. pfd	85	87½	116	116½	+3
B. F. Goodrich Co. com	26	27	72	73	+ ¾
B. F. Goodrich Co. pfd	88	..	111	112	..
Goodyear Tire & Rubber Co. com	180	185	330	335	—8
Goodyear Tire & Rubber Co. pfd	98½	100	110	112½	—1
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co. com	..	..	34	35	+1
International Motor Co. pfd	..	..	60	65	+10
†Kelly-Springfield Tire Co. com	..	..	295	298	—5
	..	..	74½	75	+½
Kelly-Springfield Tire Co. 1st pfd	75	80	97	98	+ ½
Kelly-Springfield Tire Co. 2d pfd	90	95	74¾	75	+4
Maxwell Motor Co. com	13¾	14¼	74½	76	+ ¾
Maxwell Motor Co. 1st pfd	43	44	99	101	— ¼
Maxwell Motor Co. 2d pfd	16½	17½	55	56	—1⅝
Miller Rubber Co. com	..	..	240	245	—8
Miller Rubber Co. pfd	..	..	111	113	+2
New Departure Mfg. Co. com	..	..	..	..	..
New Departure Mfg. Co. pfd	..	..	..	..	..
Packard Motor Car Co. com	..	100	145	148	+5
Packard Motor Car Co. pfd	89	..	101	104	+1
Paige-Detroit Motor Car	..	..	700	..	..
Peerless Motor Truck Corp	..	..	34½	34¾	+2½
Portage Rubber Co. com	..	..	60	65	—5
Portage Rubber Co. pfd	..	..	99	100	+1
Regal Motor Co. pfd	..	..	18	24	+1
*Reo Motor Truck Co	10½	11½	23	25	..
*Reo Motor Car Co	21½	22½	54	55½	..
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	47	49	86	88	—3½
Stewart-Warner Speed. Corp. pfd	97	100	108	..	+1
Studebaker Corporation com	35	37	152	153½	—2
Studebaker Corporation pfd	86	88	110½	111½	— ½
Swinehart Tire & Rubber Co	82	85	88	92	..
Texas Company	..	..	210	213	—2¼
U. S. Rubber Co. com	45	47	54	56	+ ½
U. S. Rubber Co. 1st pfd	95	97	107	109	..
Vacuum Oil Co	202	..	226	230	—2
White Co. pfd	..	..	110	..	..
Willys-Overland Co. com	77	78	230	250	..
Willys-Overland Co. pfd	88	92	113	114	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	97	..	161	..
Chalmers Motor Co. pfd	..	93½	101	104	..
Continental Motor Co. com	155	180	245	255	+4
Continental Motor Co. pfd	..	75	91	..	+ ½
General Motors Co. com	68	70	460	475	+17½
General Motors Co. pfd	85½	87	113	115	—1
Maxwell Motor Co. com	14	15	73	74½	—1¾
Maxwell Motor Co. 1st pfd	43	45	98	100	—1
Maxwell Motor Co. 2d pfd	17	18½	52½	55½	—2¼
Packard Motor Car Co. com	..	100	145	150	+9
Packard Motor Car Co. pfd	89	..	98½	100	—1½
Paige-Detroit Motor Car Co	..	..	700	..	..
*Reo Motor Car Co	21¾	22⅛	54⅝	55½	+1
*Reo Motor Truck Co	10½	11⅛	23	24¼	— ¼
Studebaker Corporation com	..	..	150	153	—3½
Studebaker Corporation pfd	..	..	112	115	+2

INACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
*Atlas Drop Forge Co	..	25	..	29	..
Ford Motor Co. of Canada	..	500	2000	2750	..
Kelsey Wheel Co	185	..	220	..	—5
*W. K. Prudden Co	..	20½	24⅛	..	—1⅛
Regal Motor Car Co. pfd	..	25	18	24	..

*Par value $10. †Upper quotation is old stock; 2d pfd. is new stock.

France Opens Tractor School

To Instruct Farm Workers in Handling and Caring for Motor Implements

PARIS, Nov. 24—France inaugurated its first agricultural motor school this week at Herblay, about 20 miles to the north of Paris. Since the outbreak of war there has been a radical change in French agricultural methods, the shortage of horse, the lack of men, and the destruction in certain regions of all agricultural instruments having decided farmers everywhere to change from horse to mechanical traction. This movement has been accentuated by the government scheme under which substantial subsidies are offered toward the purchase of agricultural tractors and motors, and the assurance that by 1917 denaturized alcohol will be a cheap national motor fuel. The end of the war will find the whole of the farms in the north and northeast of France in a devastated condition. As the State will provide funds for reconstruction, it is obvious that farmers will be open to take the most modern equipment.

The school just established seeks to instruct farmers and farm workers in the handling and maintenance of various types of agricultural tractors. A large amount of land is available for practical work in the fields, but great importance is attached to repairs and general workshop instruction. The usual farm buildings have been converted into workshops equipped with forge, drill press, lathe, grinding machine, and a good collection of tools. It is intended that the farmer who goes through the course shall be capable of carrying out all mechanical repairs in the maintenance of a fleet of tractors.

The demonstration machines are all of American construction. They comprise a twin-cylinder three-wheel Bull tractor; the Twin-City three-wheel tractor; the twin-cylinder Bijou; the four-cylinder Bullock caterpillar tractor, and the Aultmann & Taylor 60 hp. tractor. The first four machines were demonstrated on the inauguration day, and all of them being suited to local conditions attracted favorable comment. The fifth machine has not the same general application on French farms and was not brought out.

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Plan Tractor Demonstration

MADISON, WIS., Dec. 4—A demonstration and exposition of farm tractors will be conducted on the farm of the college of agriculture of the University of Wisconsin near Madison during the summer of 1916. It will be the first event of the kind to be held in Wisconsin. The promoters include the college of agriculture; Madison Chamber of Commerce; the agricultural newspapers of the State; the country newspapers of Wisconsin, and the association of farm tractor manufacturers. Rules and regulations to govern the demonstration are now being formulated by the Society of American Agricultural Engineers, of which F. M. White, Madison, is secretary. It is expected that at least thirty-five tractor builders will participate in the tests.

Fined $500 for Speeding

ST. LOUIS, MO., Dec. 2—The police and court campaign against speeders and careless automobile drivers reached a climax here to-day when one police judge fined Wallace M. Allison, a nineteen-year old service car driver, $500 for speeding and another jurist fined Edwin Bolles $250 for running down and injuring a passenger alighting from a street car.

About the same time a warrant charging violation of the State law against careless driving was issued against John Hagen, another service car driver.

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Electric Makes Hartford-Washington Trip in 3 Days

HARTFORD, CONN., Dec. 4—A. E. Parsons, general manager of the Detroit Electric Car Co. of Connecticut delivered on Wednesday of this week to Congressman and Mrs. P. Davis Oakey of Hartford, Conn., a Detroit electric brougham at Washington, D. C. Mr. Parsons made the trip from Hartford to Washington unaccompanied, a total distance of 372½ miles, in three days or 21½ hr. of actual running time. He started from *The Times* office in Hartford, where he was checked out at 8.55 Monday morning.

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Sue Detroit Speedway

DETROIT, MICH., Dec. 7—A suit was filed to-day in the Wayne county circuit court against the Detroit Motor Speedway by Butler & Toy, representing sixty workmen employed by the latest contractor to build the speedway. The men assert that over $3,000 is coming to them, having received only 2 weeks' pay.

In the bill of complaint the following officers, directors, contractors and parties to the purchase of land have been named by the claimants:

John B. Whelan, president; Selden D. Maddux, vice-president; Robert B. Swart, secretary; Albert Hartenstein, treasurer; William L. Wild, Albert Pudrith, Ralph M. Tate, Philip Breitmeyer, directors. Frank G. Smith, George F. W. Reid and Samuel Vreeland are named as parties to the land purchases of the company. Michael J. McCarthy, Denny Bush, John Hagerty, Wilfred F. Raymond and Wilfred Rackemann, alias John Doe, are named as principals in contracts for construction of the speedway.

New Gasoline Rules in Minn.

67 Inspectors Are Instructed to See That Dealers State Gravity of Fuel

ST. PAUL, MINN., Dec. 4—New rules have been put out by the State fire marshal for use, handling, storage and sale of gasoline in Minnesota. Gasoline must be kept in 60-gal. cans, when kept outside a building, under fireproof cover; in 200-gal. lots if within a building utilized for no other purpose; and in 600-gal. lots if in a metal tank of not less than 14-gage galvanized steel. Sealed portable filling tanks of not more than 60 gal. capacity may be used inside garages, but these tanks must be of not less than 7-gage steel supported on wheels. The body of the tank is not to be less than 6 in. from the floor and must be provided with an approved pump.

Sixty-seven assistants of the Minnesota oil inspector have been instructed to see that dealers in gasoline state the gravity of the liquid on placards in full view of customers.

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New Setting for Palace Show

NEW YORK CITY, Dec. 6—An original setting, quite different from that of other years has been conceived for the 1916 national show, which opens in the Grand Central Palace on New Year's Eve. Manager S. A. Miles says the interior of the building is to be "The Palace of Motoria."

Motoria is the goddess who watches over the automobile industry and who, visualized in statuary, has graced a number of automobile shows in the past. She stands aloft with hands outstretched upon the steering wheel, her draperies blown by the breeze.

In general aspect the interior will be a combination of 25,000 yd. of maroon velvet festooned in deep blue and gold with the marble Corinthian and Doric Columns. Illumination will be from large electroliers, each of which has eighteen balls of fire inclosed in frozen glass with glass of other hues to give a touch of color. On the main floor tubular electric signs will be used to show the name of each car, as at last year's show.

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Dodge Contract for Van Speedometer

ELGIN, ILL., Dec. 6—Contracts for supplying 100,000 speedometers for the 1916 output of the Dodge Bros. automobile plant, have been signed by the Van Sicklen Speedometer Co., this city. This contract in addition to others made with

the Mercer and New Era company, will necessitate doubling the production. It is planned to turn out 750 speedometers per day during the coming year. Fourteen different companies are now being supplied with speedometers for their cars. At present 225 persons are employed. This number will be doubled. Because of the extensive manufacture of war material in this country, the company is meeting with difficulty in securing tools.

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387 Dealers Celebrate Harry Newman Day in Milwaukee

MILWAUKEE, WIS., Dec. 4—The most elaborate introduction of a new agent or distributor to the Wisconsin territory was the celebration of Harry Newman Day here on Friday, Dec. 3, when Harry Newman, Inc., Chicago, Ill., formally made his bow to Wisconsin, Upper Michigan, Southern Minnesota and Eastern Iowa as representative of the Chalmers Motor Co., Detroit, and succeeded in placing the allotment of 1250 Chalmers cars.

Visitors were taken in hand as soon as they stepped from the trains. New Chalmers sixes whisked them up Grand Avenue to the Newman garage at Seventh Street. The registration of dealers at the garage was 387.

Friday evening Mr. Newman gave a banquet at the Hotel Pfister to the visiting dealers, members of the Milwaukee Automobile Dealers, Inc., prominent city and State officials and members of the press. The guest of honor was Hugh Chalmers, who came from Detroit with Frank C. Willys, assistant manager of sales, for the occasion.

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Large Sales at El Paso Automobile Week

EL PASO, TEX., Dec. 4—Visitors to El Paso from all parts of the Southwest, the home people, the dealers and everyone else are delighted with the entertainment and success that attended the carrying out of the idea of devoting a week to show-room displays of automobiles, trucks and accessories. It was known as El Paso Automobile Week, and the program was brought to a close Nov. 27. Instead of concentrating the exhibits in a single showroom, it was decided to have each dealer make an individual display at his regular place of business. The plan met with favor and brought about a spirit of rivalry between the different dealers that probably produced better results from a display standpoint than had all of the exhibits been thrown together under one roof. Throngs of people visited the city during the course of the week for the special purpose of viewing the exhibits and dealers report a large business as a result of the unusual attractions that they had to offer the callers. Nearly forty-five dealers in automobiles and accessories were represented.

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Army Wants 27 Trucks

WASHINGTON, D. C., Dec. 4—In the estimates that will be submitted to Congress at this session by the War Department will be one for the purchase of twenty-seven motor trucks and one supply truck for an army motor truck company. This truck company will be assigned to a division and will be operated largely on good roads along lines of communication between the troops and the base of supplies. The motor truck of 80,000 lb. against 75,000 lb. for divisional wagon trains.

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Apelco Electrical Units in Demand

NEW YORK CITY, Dec. 7—Since the publication of the list of starting and lighting systems used on the principal cars of 1916, which appeared in the last issue, we have been informed that the Apelco equipment will be used by several more companies than those listed. Pullman and Mitchell will have Apelco apparatus on some of their models and it will also be found on Arbenz, Briscoe, Cameron, Elkhart, Herff-Brooks, Hollier, Sphinx, Richmond and Wayne cars.

Ignition System Improved in Detail

(*Continued from page* 1047)

Dixie magnetos operate on what is known as the Mason principle. The rotating shaft passes through the magnet poles instead of between them and instead of carrying an armature on which the windings are placed, the shaft carries two solid polar extensions separated by a non-magnetic distance piece. Surrounding these revolving pole pieces is a light laminated field structure carrying a core. The core carries both the primary and secondary windings and the current is generated by sending magnetic lines alternately in opposite directions through the field structure.

Advance is secured by the fact that the field can be rocked through several degrees, the rocking being accomplished by turning the timer arm with the circuit breaker in the ordinary way to advance or retard the spark. By means of this positive connection between the field and the circuit breaker, it is possible to arrange the instrument so that the sparks are produced when the magnetic lines are at their maximum, thus breaking the circuit at the peak of the current wave.

In the circuit breaker, nothing moves except the cam attached to the shaft and by this construction it is possible to adjust the contact points while the motor is running. The grounding terminal is insulated at the end of the spring clip which holds the breaker cover in position and as it bears on the center of the cover. The ground wire is also stationary while moving the timer arm.

The four- and six-cylinder instruments are identical in every respect except the distributer and timing gears. In the eight- and twelve-cylinder model the shape of the rocking field and also the polar extension is changed so that four and six sparks can be produced per revolution. The whole instrument is featured by its compactness, the windings for instance, being remarkably small, being wound on a core of only ¾-in. by ½-in.

Simms for Fours and Sixes

The Simms Magneto Co. is concentrating on four- and six-cylinder magnetos and has brought out no new instruments for engines with a larger number. It has not been found necessary in these magnetos to change the breaker mechanism to meet increased speed demands, but refinements have been made for increasing the efficiency and life as well as the accessibility. All Simms magnetos have the extended pole shoes which have featured this make for some time past and which are designed to provide maximum sparks at low speeds.

These magnetos have a timing range of from 30 to 40 deg. crankshaft travel. On the four-cylinder motors, and 20 to 26.66 deg. for six-cylinder motors.

The Simms company has discontinued the manufacture of the so-called waterproof magneto, having found it undesirabl to inclose the magneto in the conventional manner. A tightly inclosed distributer board is relied upon to prevent short-circuiting. The models available for four-cylinder engines are SU4, SU4S, and SU4D. Four sixes SU6, SU6S and SU6G. Each type is furnished with single or double magneto. All these magnetos are true high-tension instruments, having double wound armatures. The SU4 is an independent machine which can be used for single ignition or in conjunction with a separate set or battery plugs; the SU4S has auxiliary apparatus for a vibrating spark dual system; and the SU4D uses a non-vibrating spark dual system.

Factory Miscellany

Automobile Woodwork Co. Adds—The Michigan Truck & Lumber Co., Holly, Mich., will erect a one-story addition, 70 by 76 ft. The company makes automobile woodwork.

Dry Climate Tire to Build—The Dry Climate Tire Co., Denver, Colo., plans to establish a branch plant at El Paso, Texas, for the manufacture of casings and inner tubes.

Mason Tire Secures Site—The Mason Tire and Rubber Co., Cleveland, Ohio, has secured a site at Kent, Ohio, and will construct a factory, the estimated cost being $60,000.

To Make Automobile Gates — The United States Auto Gate Mfg. Co., Tacoma, Wash., has filed articles of incorporation to manufacture automobile gates. A plant will be constructed in Sequim, Wash.

Motor Hearse Co., Doubles Capacity—The Michigan Hearse & Motor Co., Grand Rapids, Mich., maker of automobile hearses, is doubling its capacity by the erection of an addition to cost about $20,000.

Cleveland Ford Tire to Build—The Cleveland Ford Tire Co., Cleveland, Ohio, has awarded the contract for the construction of a two-story, 73 by 150-ft. plant at Ashtabula, Ohio. The estimated cost is $22,500.

Chicago Nut Co. to Build—The Chicago Nut Co., manufacturer of brass nuts, has awarded the contract for the construction of a two-story factory at 2513 West Twentieth Street, Chicago, the estimated cost being $38,000.

Pierce-Arrow to Add—The Pierce-Arrow Motor Car Co., Buffalo, N. Y., has let contract for the erection of a laboratory and experimental building, 50 by 90 ft., two stories, at its plant at Elmwood Avenue and New York Central Railroad Belt Line.

Chalmers Mechanical School Formed—A mechanical school has been established at the Chalmers Motor Co.'s Detroit plant by S. H. Humphries, vice-president in charge of manufacturing. Its purpose is to give a thorough mechanical education to Chalmers employees.

Denver Fuel Co. to Build—The Mountain Motor Fuel Co., Denver, Colo., expects to start building a new $40,000 plant next week on the site where its smaller plant was recently destroyed by fire and explosions. The new plant will have about twice the capacity of the old one, and will be equipped for refining and also for compounding lubricating oils.

Oakland Shipping Cars by Boat—The shortage of railroad freight cars has caused the Oakland Motor Car Co., Pontiac, Mich., to make most of its shipments during the last few weeks by road to Detroit and from there by boat to Buffalo, Cleveland and Toledo. From these cities shipments then went forward by the railroads.

J. B. D. Co. to Make Carbureters—J. B. Drahonovsky, who founded the J. B. D. Resilient Wheel Mfg. Co., 671 Smith Street, Milwaukee, has now organized the J. B. D. Carbureter Co. with $10,000 capital, to develop and market further inventions and designs in the automobile field. The new concern will occupy quarters with the Wheel company.

Motor Co. to Move to Oshkosh—The Lake Breeze Motor Co., Chicago, Ill., has filed a bond of $15,000 with the Chamber of Commerce of Oshkosh, Wis., to insure its removal from Chicago to Oshkosh. The company will be re-incorporated at once under the laws of Wisconsin, and C. C. Chase of Oshkosh, who takes a heavy financial interest, will be president. Factory quarters are now being provided in Oshkosh, and it is hoped that the company will be in shape to start actual production by March 1 or 15.

The Automobile Calendar

Dec. 6-11.....Springfield, Mass., Show, Auditorium.
Dec. 7-10.....New York City, American Society of Mechanical Engineers' Convention.
Dec. 11-18.....New Castle, Pa., Show, Skating Rink on Nechannock Avenue.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.
1916
Jan. 1.....Springfield, Mo., Show, Springfield Motor Car Dealers' Assn.
Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session, Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 7-13.....Milwaukee, Wis., Show, Auditorium.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto Trade Assn.
Jan. 14-22.....Dayton, O., Show, Delco Bldg., Dayton Automobile Dealers' Assn., and Dayton Accessory Dealers' Assn.
Jan. 10-15.....New Bedford, Mass., Show, State Armory.
Jan. 15-22.....Detroit, Mich., Show, Detroit Automobile Dealers' Assn.
Jan. 17-22.....Rochester, N. Y., Show, Exposition Park, C. A. Simmons, Mgr.
Jan. 17-22.....Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22.....Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Montreal, Que., Show, Almy's Bldg., Automobile Trade Assn., Ltd.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30.....Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 9-12.....Peoria, Ill., Show, Coliseum, Peoria Automobile and Accessory Assn.
Feb. 14-19.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20-27.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26.....Portland, Me., Show, Exposition Bldg.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 28-Mar. 3....Pittsburgh, Pa., Convention of American Road Builders' Assn., Mechanical Hall.
Feb. 29-Mar. 4....Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
Mar. 8-11.....Mason City, Ia., Show, Armory.
March 21-25.....Deadwood, S. D., Show, Auditorium, Deadwood Business Club.
Mar. 28-Apr. 3....Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The Week in the Industry

Aument Resigns—E. W. Aument has resigned as superintendent of the Rock Falls Manufacturing Co., Sterling, Ill., to become general manager of the Michigan Hearse & Motor Co., Grand Rapids, Mich. The former company is also engaged in the manufacture of hearses and funeral cars. The Michigan company also manufactures its own chassis.

Changes in Hyatt Service Branches—The rapid extension of the service given by the Hyatt Roller Bearing Co., Newark, N. J., has necessitated several additions to the personnel of the various service branches.

L. R. Remington, formerly in charge of the Hyatt direct service branch at Atlanta, Ga., has been made service manager at Chicago, Ill. He will succeed J. R. Phillips. R. B. Campbell, recently manager of the service branch at Detroit, Mich., goes to Atlanta, Ga., to take charge of the work in that territory. J. W. Taylor, a new man in the Hyatt organization, has been named as service manager at Detroit.

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Dealer

New Home for Abbott-Toledo—The Abbott-Toledo Co., Toledo, Ohio, will be situated at Madison Avenue and Thirteenth Street.

Ford Buys Brooklyn Site—The Ford Motor Co. has purchased a site on the Eastern Parkway and Bedford Avenue, Brooklyn, N. Y., on which a large structure will be erected. This building will be used as a showroom.

Firestone Tire Buys Brooklyn Bldg.—The Firestone Tire and Rubber Co. has purchased the building at the corner of Sterling Place and Bedford Avenue, Brooklyn, N. Y., now occupied by the Ford company. The Firestone company now occupies the building at 1197 Bedford Avenue.

Denver News Items—Tom Botterill, 1278 Broadway, Denver, Pierce and Hudson distributor for Colorado and Wyoming, and Dodge dealer for Denver and vicinity, is re-arranging his office and salesroom to provide for more show space for cars on account of closing his separate Dodge salesroom at 1530 Broadway and handling all three lines at the one place.

Mulnix & Rarie, Grant distributors for Colorado and Wyoming, with salesroom at 17 East Colfax Avenue, Denver, have opened a nearby Grant service station at 1431 Cleveland Place, with George Hale, formerly of the Grant factory, in charge.

Motor Men in New Roles

Mohler Pathfinder Production Mgr.—C. M. Mohler has joined the Pathfinder Co., Indianapolis, as production manager.

Schmidt Joins N. Y. Metz—W. L. Schmidt has joined the Robert Lurie Co., New York City, eastern distributor of the Metz, as secretary and treasurer.

Kelly Joins White—George Kelly, of the Baker R. & L. Co., Cleveland, has left that company and joined the White Co. He will devote his attention to truck sales.

Harrington, N. Y. Packard Sales Head—A. C. Harrington, for thirteen years a a member of the Packard forces, has been appointed sales manager of the Packard Motor Car Co. of New York.

Weimer to Form Wagner Station—Otto Weimer, who has been in charge f the Wagner Electric Co.'s exhibit at the Panama-Pacific fair, will shortly establish a service station in Portland, Ore.

Carey Goes to Portland—W. H. Carey, after resigning his position with the Kelly-Springfield Tire Co. at San Francisco, has come to Portland to take charge of the Portland agency, which is operated in conjunction with the Oregon Motor Car Co.

Griffin Maxwell Rep.—Jack Griffin, former Los Angeles newspaper man, has been appointed special Western factory representative of the Maxwell Motor Sales Corp., with headquarters at San Francisco, and territory embracing California, Oregon, Washington, Idaho, Montana, Utah, Nevada and Arizona.

Ruddle Los Angeles Mercer Mgr.—Jack Ruddle, a veteran of the automobile industry in Southern California, has been appointed manager of the Los Angeles retail Mercer house by George R. Bentel, who now controls the Mercer throughout the entire territory west of Denver.

Montgomery Pasadena Kissel Head—The Pacific Kissel Kar branch, with offices and salesrooms in Los Angeles and San Francisco, has opened a branch at 130 East Union Street, Pasadena. The Pasadena territory was formerly controlled by a sub-agent. J. H. Montgomery has been appointed manager of the new branch.

Gans New Studebaker Indianapolis Mgr.—E. W. Gans has been appointed manager of the Indianapolis district office of the Studebaker Corp. Mr. Gans, before his affiliation with the latter company, was for seven years with the White Co., where he held the position of southern manager.

Burt Joins Henney Buggy—R. M. Burt has taken a position as special representative with the Henney Buggy Co., Freeport, Ill., and will introduce the company's new line of commercial bodies for Ford chassis. The company recently decided to devote a large portion of the buggy plant to the manufacture of car bodies, the demand for horse-propelled vehicles falling off greatly of late years.

Atwood Makes Cleveland Change—B. E. Atwood, who for a number of years was connected with the Cleveland branch of the Ford Motor Co., is now identified with the Coate Motor Co., Cleveland distributor of Paige and Pullman cars, as secretary and manager. L. E. Green, R. E. Craig and L. E. Von Heyningen, formerly with the Ford company, have also joined the Coate company, in full charge of the sales in Cuyahoga County.

Bawden Overland Factory Rep.—F. P. Bawden, formerly receiver of the Child, Day & Churchill Automobile Supply Co., Spokane, Wash., has been appointed factory representative for the Inland Empire for the Willys-Overland Co. Mr. Bawden will make his headquarters with the Harry L. Olive Co., Overland representative in Spokane, and will be under the supervision of J. V. Hough, who has been promoted to take charge of the northwest states, with headquarters in Seattle.

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Dealer

Newark Pierce to Add—The Ellis Motor Car Co., Newark, N. J., Pierce-Arrow distributor, will build a 90 by 106-ft. garage on New Street.

Prest-O-Lite Opens Battery Station—The Prest-O-Lite Co. has opened a service station for the charging, care and repair of storage batteries at its Cleveland branch at 2032 Euclid Avenue.

Seattle Midgley Adds Territory—The Midgley Tire and Distributing Co., Seattle, of which E. K. Allen is manager, have been appointed distributor of this tire throughout the State of Washington. Quarters have been opened at 1609 Eighth Avenue.

Motor Equipment Co. Moves—The Motor Car Equipment Co., New York City, which for the past five years has been located at 55 Warren Street, has leased the entire building at 19-21 West Sixty-second Street. This structure comprises 55,000 sq. ft.

Takes Falcon Tire Agency—The Buckeye Tire & Supply Co., 75 South Fourth Street, Columbus, Ohio, has taken the central Ohio agency for the Falcon line of tires.

Takes Top Agency—The Cott-McKelvey Auto Co., 446 North High Street, Columbus, Ohio, has taken the central Ohio agency for the Cozy Cab tops, designed for Ford cars.

Springfield Supply House Adds—The United Tires and Sales Co. has established a branch salesroom at 302 East Washington Street, Springfield, Ill., with N. F. Neidringhaus as manager. Tire repairing and car painting will be specialties, while a full line of accessories and tools will be carried. The company is agent for the Vortex Manufacturing Co., Cleveland, and the Schelp-Budke Tire and Rubber Co., St. Louis. The agency will also distribute the Pitner lighting system.

New Willard Stations—The Willard Storage Battery Co., Cleveland, has added a number of service stations in various parts of the country.

The new stations are: Athol Storage Battery Station, Athol, Mass.; F. H. Smith, Pekin, Ill.; James Workman & Sons, Steubenville, Ohio; East Hill Auto Repair Co., Sharon, Pa.; John Electric Co., New Castle, Pa.; Duncan & Fraser, Ltd., Adelaide, Australia; Chellin's Garage, Litchfield, Minn.; New Rochelle Storage Battery Co., New Rochelle, N. Y.; Charles C. Smith, Port Richmond, S. I.; A. A. Seeley, Jr., Troy, N. Y.; Shary Garage, Fairbury, Neb.; Lew & Clark, Baker, Ore.; H. M. Cates & Son, Houlton, Me.; Consolidated Auto Supply Co., Inc., New York City; Plainfield Storage Battery Co., Plainfield, N. J., and Mission Garage, Portersville, Cal.

St. Louis Ford Building Started—The foundation for the $300,000 addition to the local Ford assembling plant at Sarah Street and Forest Park Boulevard, St. Louis, Mo., have been dug and the concrete work is now well under way. The builders hope to finish the concrete work before the bad weather sets in. The addition, which will be a duplicate of the present Ford building there, will be ready for occupancy early next year.

Recent Newark Changes—The Paige-Detroit Co., 588 Broad Street, Newark, N. J., has been formed. J. H. Knox is manager.

The Moon Motor Car Co. of New York, has formed the Motor Sales Agency in Newark at 607 Bloomfield Avenue and at Main and Clinton Streets, East Orange. The Moon agency will embrace Newark, the Oranges and Montclair. H. F. Herdman is president of the new company.

The Mallon Motor Car Co., distributor for the Franklin in Newark, which was formerly located at 35 Halsey Street, has moved into its new quarters at 296-298 Washington Street.

The Bonnell Motor Car Co. has taken the Newark agency for the Haynes.

New Milwaukee Dealer—The Fowler Motor Sales Co. has been organized at Milwaukee by J. C. Fowler, formerly of La Crosse, Wis., who has purchased the business of the Creek Motor Sales Co., 441-445 Jackson Street, agent for the Inter-State and Apperson in Wisconsin and Upper Michigan. Mr. Fowler has effected a close organization, which includes: F. C. Yahr, in charge of retail sales; R. G. Bates, Milwaukee, city sales; A. B. Kent and W. J. Dieman, wholesale representatives.

Give Ford Oiler Territory—The selling territory in eastern Missouri and southern Illinois for the Strong Sight-Feed Oiler for Fords has been divided up among the following four St. Louis firms: Missouri Auto Specialty Co., Illmo Mdse. Co., Campbell Iron Co. and Beck and Corbitt Iron Co. The Strong oiler is manufactured by the Perkins Mfg. Co., Des Moines, Iowa.

Nowick Double Tread Agent—Philip Dolkart has bought out the Nowick Double Tread Tire Co. at 1320 Broadway, Denver.

Louisville Agent Moves—The Kentucky Automobile Co., agent for the Cadillac and Oakland, moved Nov. 15 to the new quarters at 728-730 Fourth Street, Louisville, Ky. This is the building erected several years ago by the Olds Motor Works as a sales and distributing station for the South. It is a three-story fireproof structure.

N. Y. Goodyear Leases—The Goodyear Tire & Rubber Co., New York City, has leased a store at 10 Central Park West, with a large basement space and offices on the second floor.

New Redfield Carbureter Station—The Delmar Automobile Co., 103-5 Orange Street, Wilmington, Del., has completed arrangements to become the service station in Wilmington for the Redfield carbureter.

Minneapolis Items—The Wilcox-Bennett Carburetor Co. is expending $4,000 for a new building at 1024-1026 Ramsey Street. It will be a two-story brick. The Electric Detector Co., 2905 Nicollet Avenue, has changed management, Fred J. Fowler now in charge. The Hudson-Thurber Co., 308 Third Avenue N., hardware, recently adding automobile accessories, has been awarded the exclusive agency in the immediate vicinity for Timken roller bearings.

Trade News from St. Paul—The Brahy-Frei Auto Co., W. H. Frei, manager, has been organized and opened garage, salesroom, storage and machine shop at 825 Selby Avenue. It has taken the Auburn local agency. The Roller Motor Co. is constructing a brick and stone garage, one-story, at Smith Avenue and West Sixth Street to cost $2,000. It is 50 by 70 ft. The Twin City Cord Tire Co., which expects to open a factory in the Gloster shops of the Northern Pacific railroad, has new offices at 1002 Pioneer building.

Excavation has begun for the Twin City Four Wheel Drive Co., $51,000 building at University Avenue and Pelham Street. It will be brick, two stories and will have store fronts and factory facilities. The building is 200 by 142 ft. and is only one block from the new plant of the Overland Stores Co.

South Dakota Changes—Horace Key has sold the Key Auto Co., Huron, S. D., to C. E. Alford, Redfield, S. D., who has changed the name to the Alford Overland Co. Mr. Key has opened a salesroom and will continue to represent the Buick. The F. A. Castle garage has been sold to E. W. Barrett. At Sioux Falls Lind Bros., who came from Centerville, S. D., have leased the former Folkens garage, 324 N. Phillips Avenue. The salesrooms in connection will be used to display Oakland cars.

Cheyenne Hudson to Build—W. E. Dinneen, Cheyenne, Wyo., agent for the Hudson, plans to enlarge his quarters by putting up a new building on an adjoining site. The new building will be used for his machine shop, thus making more room in the present place for salesroom and storage.

Trade Changes in Milwaukee.—The Auburn Motor Sales Co. of Milwaukee, which has just been incorporated with $5,000 capital stock to act as State agent for the Auburn, has leased the former E. F. Sanger garage at 441 Jackson Street, Milwaukee, as headquarters and service station. Mr. Sanger moves to the new Sanger garage at 564-574 Farwell Avenue.

The Noble Z. Smith Co., Green Bay, which has been appointed distributor of National cars for the Fox River Valley district of Wisconsin, has established an office at 730 College Avenue, Appleton, Wis., in addition to maintaining an office in Green Bay, in the Gazette Building.

The Dicke Motor Car Co., Manitowoc, district agent for the Ford, has established a branch house and agency at Two Rivers, Wis., under the name of Two Rivers Auto Supply Co. The company will operate a service station for Ford cars and sell supplies and accessories.

Frisco Goodyear Enlarges Firm.—J. E. Power, who has the agency for the Goodyear truck tires in San Francisco, Cal., and was recently appointed distributor of Goodyear pneumatic tires, has enlarged his firm by forming a co-partnership with T. J. Turner and Frank Marisch. The new firm will be known as the Power, Turner & Marisch.